

US EPA ARCHIVE DOCUMENT

**PROPOSED**  
**TOTAL MAXIMUM DAILY LOAD (TMDL)**  
**For**  
**Dissolved Oxygen and Nutrients**  
**In**  
**Mullet Creek Tidal (WBID 1575)**

**November 2012**



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**SUMMARY SHEET for WBID 1575****Total Maximum Daily Load (TMDL)****2009 303(d) Listed Waterbodies for TMDLs addressed in this report:**

WBID	Segment Name	Class and Waterbody Type	Major River Basin	HUC	County	State
1575	Mullet Creek Tidal Watershed	Class III Marine	Tampa Bay Tributary	03100206	Pinellas	Florida

**TMDL Endpoints/Targets:**

Dissolved Oxygen and Nutrients

**TMDL Technical Approach:**

The TMDL allocations were determined by analyzing the effects of TN, TP and BOD concentrations on DO concentrations in the waterbody. A watershed model was used to predict delivery of pollutant loads to the waterbody and to evaluate the in-stream impacts of the pollutant loads.

**TMDL Waste Load and Load Allocation**

Constituent	Current Condition		TMDL Condition		Percent Reduction		
	WLA (kg/yr)	LA (kg/yr)	WLA (kg/yr)	LA (kg/yr)	WLA	LA	MS4
Total Nitrogen	--	6,258	--	1,513	--	76%	76%
Total Phosphorus	--	1,205	--	132	--	89%	89%
Biochemical Oxygen Demand	--	9,287	--	4,351	--	53%	53%

**Endangered Species Present (Yes or Blank):** Yes**USEPA Lead TMDL (USEPA or Blank):** USEPA**TMDL Considers Point Source, Non-point Source, or Both:** Both**NPDES Discharges to surface waters addressed in USEPA TMDL:**

Permit ID	Permittee(s)	County	Permit Type
FLS000005	Pinellas County, City of Tarpon Springs, FDOT (District VII)	Pinellas	Phase I MS4

## 1.0 INTRODUCTION

Section 303(d) of the Clean Water Act requires each state to list those waters within its boundaries for which technology based effluent limitations are not stringent enough to protect any water quality standard applicable to such waters. Listed waters are prioritized with respect to designated use classifications and the severity of pollution. In accordance with this prioritization, states are required to develop Total Maximum Daily Loads (TMDLs) for those water bodies that are not meeting water quality standards. The TMDL process establishes the allowable loadings of pollutants or other quantifiable parameters for a waterbody based on the relationship between pollution sources and in-stream water quality conditions, so that states can establish water quality based controls to reduce pollution from both point and nonpoint sources and restore and maintain the quality of their water resources (USEPA 1991).

The Florida Department of Environmental Protection (FDEP) developed a statewide, watershed-based approach to water resource management. Under the watershed management approach, water resources are managed on the basis of natural boundaries, such as river basins, rather than political boundaries. The watershed management approach is the framework FDEP uses for implementing TMDLs. The state's 52 basins are divided into five groups and water quality is assessed in each group on a rotating five-year cycle. FDEP also established five water management districts (WMD) responsible for managing ground and surface water supplies in the counties encompassing the districts.

For the purpose of planning and management, the WMDs divided the district into planning units defined as either an individual primary tributary basin or a group of adjacent primary tributary basins with similar characteristics. These planning units contain smaller, hydrological based units called drainage basins, which are further divided by FDEP into "water segments". A water segment usually contains only one unique waterbody type (stream, lake, canal, etc.) and is about five square miles. Unique numbers or waterbody identification (WBID) numbers are assigned to each water segment. This TMDL addresses WBID 1575, which is a Group 1 waterbody located in the Coastal Old Tampa Bay Tributary Planning Unit and is managed by the Southwest Florida Water Management District (SWFWMD). WBID 1575 is impaired for dissolved oxygen (DO) and nutrients.

## 2.0 PROBLEM DEFINITION

To determine the status of surface water quality in Florida, three categories of data – chemistry data, biological data, and fish consumption advisories – were evaluated to determine potential impairments. The level of impairment is defined in the Identification of Impaired Waters Rule (IWR), Section 62-303 of the Florida Administrative Code (FAC). The IWR is FDEP's methodology for determining whether waters should be included on the state's planning list and verified list. Potential impairments are determined by assessing whether a waterbody meets the criteria for inclusion on the planning list. Once a waterbody is on the planning list, additional data and information will be collected and examined to determine if the water should be included on the verified list.



The TMDLs addressed in this document are being established pursuant to commitments made by the United States Environmental Protection Agency (USEPA) in the 1998 Consent Decree in the Florida TMDL lawsuit (Florida Wildlife Federation, et al. v. Carol Browner, et al., Civil Action No. 4: 98CV356-WS, 1998). That Consent Decree established a schedule for TMDL development for waters listed on Florida's USEPA approved 1998 section 303(d) list. The 2009 section 303(d) list identified numerous WBIDs in the Coastal Old Tampa Bay Tributary Planning Unit as not meeting water quality standards. After assessing all readily available water quality data, USEPA is responsible for developing TMDLs to address dissolved oxygen and nutrients for WBID 1575, depicted in Figure 2.1.

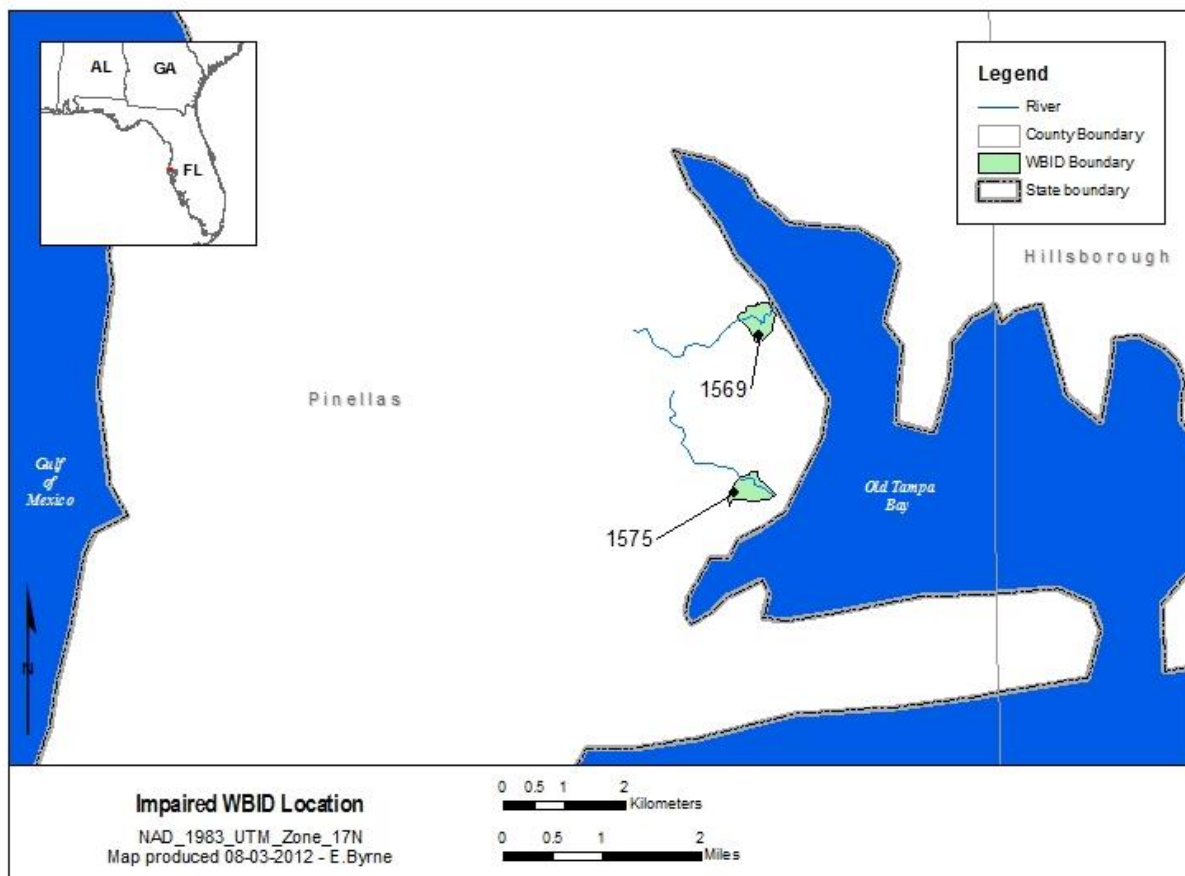


Figure 2.1 Location of WBID1575 in the Coastal Old Tampa Bay Tributary Planning Unit

### 3.0 WATERSHED DESCRIPTION

#### 3.1 *Hydrologic characteristics*

Tampa Bay is located along the central west coast of Florida and includes Old, Middle, and Lower Tampa Bay and Hillsborough Bay. The bay extends about 35 miles inland from the Gulf of Mexico and is 5 to 10 miles wide for most of its length. Watersheds flowing to the bay cover about 2,200 square miles with more than 100 tributaries, including the two that are the subject of

this report. More specifically, Mullet Creek is a tributary to Old Tampa Bay which is located in the northern portion of the bay west of the city of Tampa.

Mullet Creek is an urban stream that is mainly located in the City of Safety Harbor in central Pinellas County. The creek primarily flows in a south-easterly direction and drains about 2.9 square miles of fresh water into the west side of Mullet Creek Tidal, which then discharges into Old Tampa Bay. The Mullet Creek basin is mainly located in the central portion of the City of Safety Harbor, but also includes areas in the City of Clearwater. The Mullet Creek Tidal watershed is identified as WBID 1575.

### **3.2 Climate**

The Coastal Old Tampa Bay Planning Unit is located on the west coast of Central Florida and experiences a subtropical climate with hot, humid summers and mild, short winters. Average high temperatures in the summer are in the low 90s (°F), and average low temperatures in the winter are in the upper 40s (°F). An average of 52 inches of rain every year is received in this part of Central Florida, of which a greater percentage falls during the wet season from June through September (SERCC 2012).

### **3.3 Land Use**

All of the land use in WBID 1575, Mullet Creek, is classified as high intensity developed land use (Figure 3.1 and

Table 3.1). The actual drainage area for Bishop Creek is significantly larger at 2,257 acres (Figure 3.2). The United States Geological Survey National Hydrography Dataset was used to delineate the drainage area. The contributing watershed is dominated by developed land uses, and 60 percent of the watershed is classified as high developed land uses (Table 3.2).

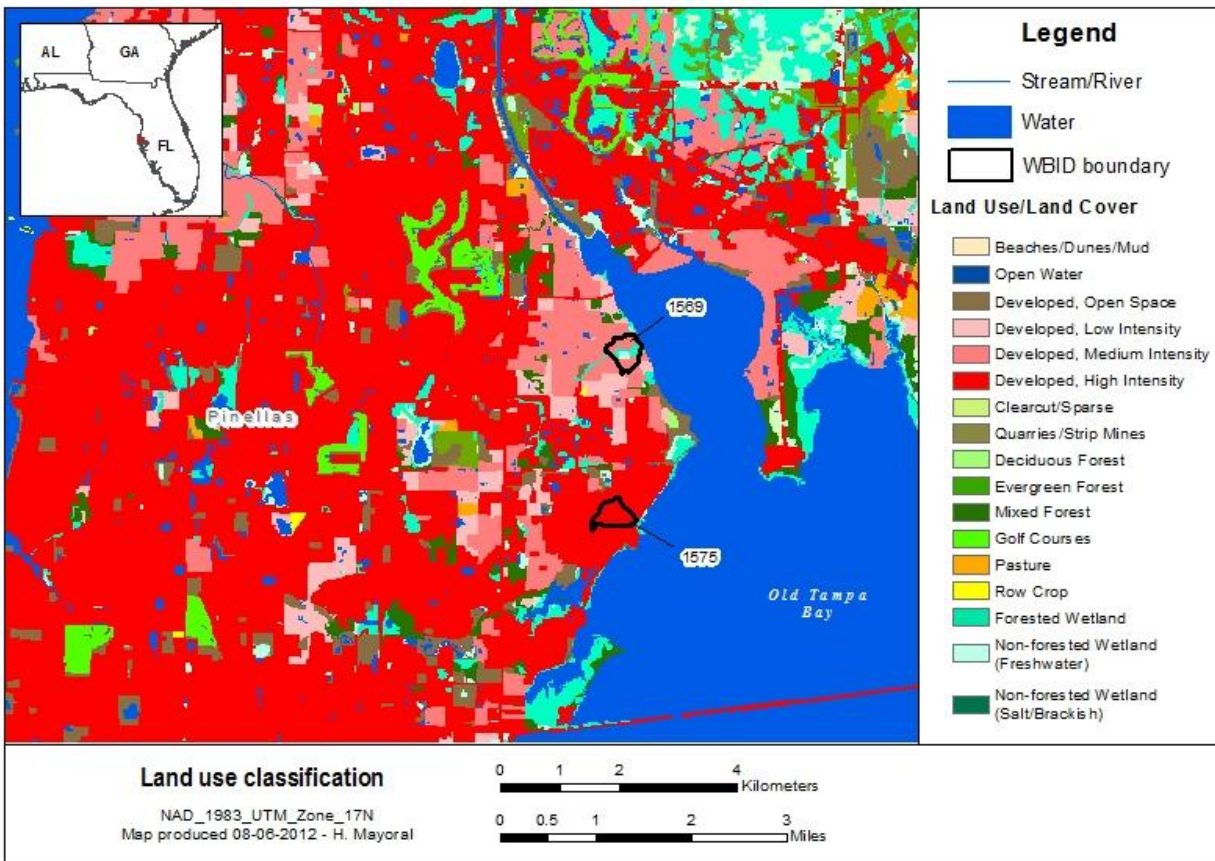


Figure 3.1 Land use for WBID 1575 in the Coastal Old Tampa Bay Tributaries Planning Unit

Table 3.1 Land use distribution for WBID 1575 in the Coastal Old Tampa Bay Tributaries Planning Unit

Land Use Classification	WBID 1575	
	Acres	%
Evergreen Forest	0	0%
Deciduous Forest	0	0%
Mixed Forest	0	0%
Forested Wetland	0	0%
Non-Forested Wetland (Freshwater)	0	0%
Non-Forested Wetland (Salt/Brackish)	0	0%
Open Water	0	0%
Pasture	0	0%
Row Crop	0	0%
Clear cut Sparse	0	0%
Quarries Strip mines	0	0%
Utility Swaths	0	0%
Developed, Open Space	0	0%
Developed, Low intensity	0	0%
Developed, Medium intensity	0	0%
Developed, High intensity	58	100%
Beaches/Dunes/Mud	0	0%
Golf Courses	0	0%
Totals	58	100%



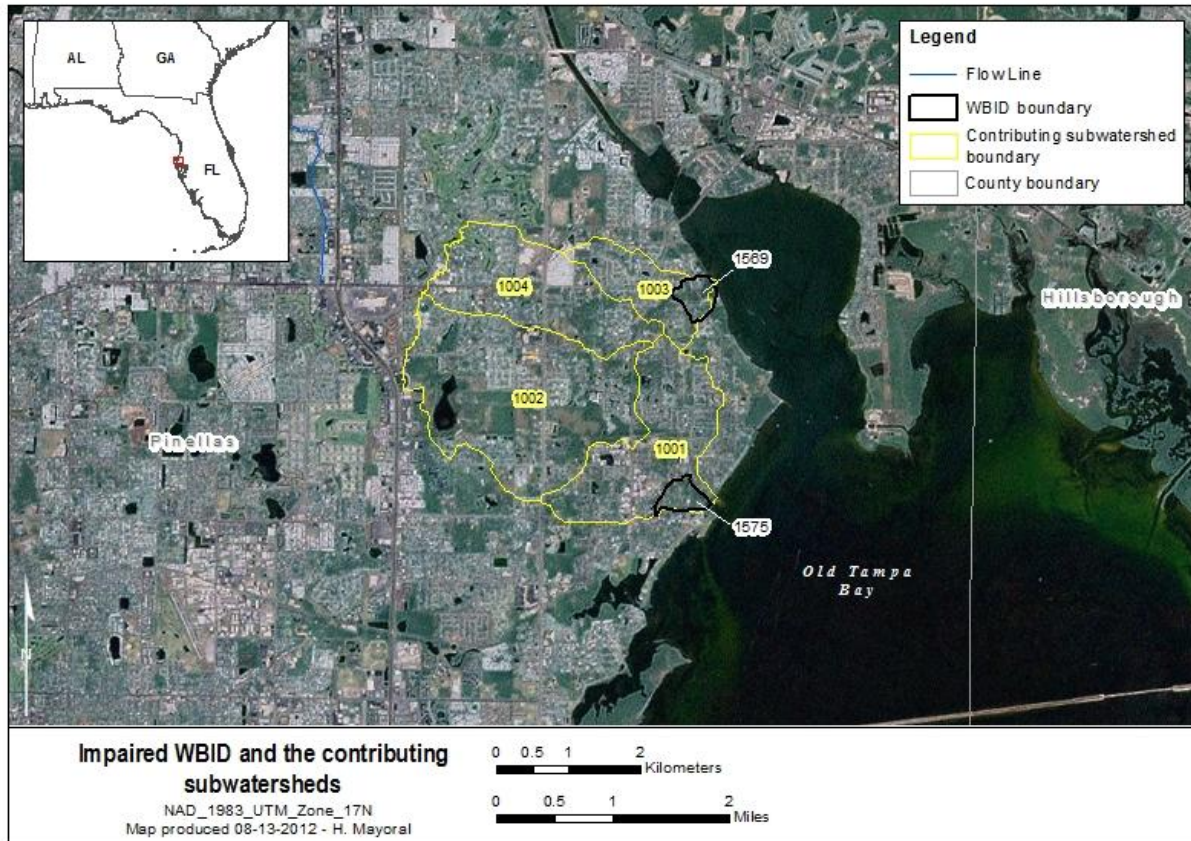


Figure 3.2 Aerial photograph illustrating contributing subwatersheds and impaired WBID boundaries

Table 3.2 Land use distribution for contributing subwatersheds to WBID 1575 in the Coastal Old Tampa Bay Tributaries Planning Unit

Land Use Classification	Contributing subwatersheds to WBID 1575	
	Acres	%
Evergreen Forest	77	3
Deciduous Forest	0	0
Mixed Forest	39	2
Forested Wetland	100	4
Non-Forested Wetland (Freshwater)	48	2
Non-Forested Wetland (Salt/Brackish)	0	0
Open Water	71	3

Land Use Classification	Contributing subwatersheds to WBID 1575	
	Acres	%
Pasture	17	1
Row Crop	3	0
Clear cut Sparse	6	0
Quarries Strip mines	0	0
Utility Swaths	0	0
Developed, Open Space	112	5
Developed, Low intensity	227	10
Developed, Medium intensity	165	8
Developed, High intensity	1333	60
Beaches/Dunes/Mud	0	0
Golf Courses	0	0
Totals	2257	100

#### 4.0 WATER QUALITY STANDARDS/TMDL TARGETS

The TMDL reduction scenarios will be done to achieve a Florida's dissolved oxygen concentration of 5 mg/L and insure balanced flora and fauna or establish the TMDL to be consistent with a natural condition if the dissolved oxygen standard cannot be achieved.

The waterbodies addressed in this report are Class III marine water having a designated use for Recreation, Propagation and Maintenance of a Healthy, Well-Balanced Population of Fish and Wildlife. Designated use classifications are described in Florida's water quality standards in Section 62-302.400, FAC. Water quality criteria for protection of all classes of waters are established in Section 62-302.530, FAC. Individual criteria should be considered in conjunction with other provisions in water quality standards, including Section 62-302.500 FAC, which established minimum criteria that apply to all waters unless alternative criteria are specified Section 62-302.530, FAC. In addition, unless otherwise stated, all criteria express the maximum

not to be exceeded at any time. The specific criteria addressed in this TMDL document are provided in the following sections.

#### **4.1 Nutrients Criteria**

Florida's recently adopted numeric nutrient criteria interprets the narrative water quality criterion for nutrients in paragraph 62-302.530(47)(b), F.A.C. See section 62-302.531(2). The Florida rule provides that the narrative water quality criteria for nutrients in paragraph 62-302.530(47)(a), F.A.C., continues to apply to all Class I/II/III waters. See section 62-302.531(1).

Florida's recently adopted rule applies to springs, streams, lakes, and some estuary segments. Florida's rule provides that numeric nutrient criteria are expressed as a geometric mean, and concentrations are not to be exceeded more than once in any three calendar year period. Section 62-302.531 and 62-302.532, F.A.C.

Should FDEP's numeric nutrient criteria become applicable water quality standards for CWA purposes before this TMDL is established, EPA will consider the nutrient target necessary to attain section 62-302.532, F.A.C. EPA will compare that target with the target necessary to attain paragraph 62-302.530(47)(a), F.A.C., to determine which target is more stringent.

##### **4.1.2 Narrative Nutrient Criteria**

Florida's narrative nutrient criteria provide:

The discharge of nutrients shall continue to be limited as needed to prevent violations of other standards contained in this chapter. Man induced nutrient enrichment (total nitrogen and total phosphorus) shall be considered degradation in relation to the provisions of Sections 62-302.300, 62-302.700, and 62-4.242. Section 62-302.530(47)(a), F.A.C.

In no case shall nutrient concentrations of a body of water be altered so as to cause an imbalance in natural populations of aquatic flora or fauna. Section 62-302.530(47)(b), F.A.C.

Chlorophyll and DO levels are often used to indicate whether nutrients are present in excessive amounts. The target for this TMDL is based on levels of nutrients necessary to prevent violations of Florida's DO criterion, set out below.

##### ***The narrative nutrient criteria for Class II and III waters are as follows:***

The discharge of nutrients shall continue to be limited as needed to prevent violations of other standards contained in this chapter. Man induced nutrient enrichment (total nitrogen and total phosphorus) shall be considered degradation in relation to the provisions of Section 62-302.300, 62-302.700, and 62-4.242, FAC. [FAC 62-302.530(47)(a)]

In no case shall nutrient concentrations of a body of water be altered so as to cause an imbalance in natural populations of aquatic flora or fauna. [FAC 62-302.530(47)(b)]

Chlorophyll and dissolved oxygen levels are often used to indicate whether nutrients are present in excessive amounts.

#### **4.2 Dissolved Oxygen Criteria**

Numeric criteria for DO are expressed in terms of minimum and daily average concentrations.

***The water quality criterion for Class III marine waters is as follows:***

Shall not average less than 5.0 mg/L in a 24-hour period and shall never be less than 4.0 mg/L. Normal daily and seasonal fluctuations above these levels shall be maintained. [FAC 62-302.530 (30)]

#### **4.3 Biochemical Oxygen Demand Criteria**

Biochemical Oxygen Demand (BOD) shall not be increased to exceed values which would cause dissolved oxygen to be depressed below the limit established for each class and, in no case, shall it be great enough to produce nuisance conditions. [FAC 62-302.530 (11)]

#### **4.4 Natural Conditions**

In addition to the standards for nutrients, DO, and BOD described above, Florida's standards include provisions that address waterbodies which do not meet the standards due to natural background conditions.

Florida's water quality standards provide a definition of natural background:

"Natural Background" shall mean the condition of waters in the absence of man-induced alterations based on the best scientific information available to the Department. The establishment of natural background for an altered waterbody may be based upon a similar unaltered waterbody or on historical pre-alteration data. [FAC 62-302.200(19)]

Florida's water quality standards also provide that:

Pollution which causes or contributes to new violations of water quality standards or to continuation of existing violations is harmful to the waters of this State and shall not be allowed. Waters having water quality below the criteria established for them shall be protected and enhanced. However, the Department shall not strive to abate natural conditions. [FAC 62-302.300(15)]

## **5.0 WATER QUALITY ASSESSMENT**

The WBIDs addressed in this report are listed as not attaining their designated use on Florida's 2009 303(d) list for dissolved oxygen and nutrients. To determine impairment, an assessment of available data was conducted. The source for current ambient monitoring data was the Impaired Waters Rule (IWR) data Run 44, using data ranging January 1, 2002 to December 31, 2010. The IWR database contains data from various sources within the state of Florida, including the WMDs and counties.



## 5.1 Water Quality Data

A complete list of water quality monitoring stations in WBID 1575 is located in Table 5.1, and an analysis of water quality data is documented in Table 5.2. Figure 5.1 shows the locations of the water quality monitoring stations within each WBID. Water quality data for WBID 1575 can be found below in Figure 5.2 through Figure 5.6, with the data from all water quality stations compiled in each figure.

### 5.1.1 Dissolved Oxygen

There are several factors that affect the concentration of dissolved oxygen (DO) in a waterbody. Natural DO levels are a function of water temperature, water depth and velocity, salinity and relative contributions from groundwater. Oxygen can be introduced by wind, diffusion, photosynthesis, and additions of higher DO water (e.g. from tributaries). DO concentrations can be lowered by processes that use up oxygen from the water, such as respiration and decomposition, and can be lowered through additions of water with lower DO (e.g. swamp or groundwater). Decomposition of organic matter, such as dead plants and animals, also consumes DO. The dissolved oxygen minimum concentration for WBID 1575 was 0.39 mg/L, and the maximum concentration was 17.14 mg/L. The mean concentration for WBID 1575 was 4.13 mg/L.

### 5.1.2 Biochemical Oxygen Demand

BOD is a measure of the amount of oxygen used by bacteria as they stabilize organic matter. The process can be accelerated when there is an overabundance of nutrients, increasing the aerobic bacterial activity in a waterbody. In turn, the levels of DO can become depleted, eliminating oxygen essential for biotic survival, and potentially causing extensive fish kills. Additionally, BOD is used as an indicator to determine the presence and magnitude of organic pollution from sources such as septic tank leakage, fertilizer runoff, and wastewater effluent. The mean BOD concentration for WBID 1575 was 1.73 mg/L. The maximum BOD concentration for WBID 1575 was 5.00 mg/L and the minimum concentration was 0.61 mg/L.

### 5.1.3 Nutrients

Excessive nutrients in a waterbody can lead to overgrowth of algae and other aquatic plants such as phytoplankton, periphyton and macrophytes. This process can deplete oxygen in the water, adversely affecting aquatic life and potentially restricting recreational uses such as fishing and boating. For the nutrient assessment the monitoring data for total nitrogen, total phosphorus and chlorophyll a are presented. Narrative nutrient criteria are used as the standards for estuarine water bodies, while numeric standards have been developed for freshwater water bodies. The purpose of the nutrient assessment is to present the range, variability and average conditions for each WBID.

#### 5.1.3.1 Total Nitrogen

Total Nitrogen (TN) is comprised of nitrate (NO<sub>3</sub>), nitrite (NO<sub>2</sub>), organic nitrogen and ammonia nitrogen (NH<sub>4</sub>). Though nitrogen is a necessary nutrient required for the growth of most plants and animals, not all forms are readily used or metabolized. Increased levels of organic nitrogen

can occur from the decomposition of aquatic life or from sewage, while inorganic forms are generally from erosion and fertilizers. Nitrates are components of industrial fertilizers, yet can also be naturally present in soil, and are converted to nitrite by microorganisms in the environment. Surface runoff from agricultural lands can increase the natural presence of nitrates in the environment and can lead to eutrophication. Usually, the eutrophication process is observed as a change in the structure of the algal community and includes severe algal blooms that may cover large areas for extended periods. Large algal blooms are generally followed by depletion in DO concentrations as a result of algal decomposition. The total nitrogen minimum concentration for WBID 1575 was 0.36 mg/L, and the maximum concentration was 1.62 mg/L. The mean total nitrogen concentration for WBID 1575 was 1.01 mg/L.

#### **5.1.3.2 Total Phosphorus**

In natural waters, total phosphorus exists in either soluble or particulate forms. Dissolved phosphorus includes inorganic and organic forms, while particulate phosphorus is made up of living and dead plankton, and adsorbed, amorphous, and precipitated forms. Inorganic forms of phosphorus include orthophosphate and polyphosphates, though polyphosphates are unstable and convert to orthophosphate over time. Orthophosphate is both stable and reactive, making it the form most used by plants. Excessive phosphorus can lead to overgrowth of algae and aquatic plants, the decomposition of which depletes oxygen in the water. The total phosphorus minimum concentration for WBID 1575 was 0.12 mg/L, and the maximum concentration was 0.35 mg/L. The mean total phosphorus concentration for WBID 1575 was 0.21 mg/L.

#### **5.1.3.3 Chlorophyll-a**

Chlorophyll is the green pigment in plants that allows them to create energy from light. In a water sample, chlorophyll is indicative of the presence of algae, and chlorophyll-a is a measure of the active portion of total chlorophyll. Corrected chlorophyll refers to chlorophyll-a measurements that are corrected for the presence of pheophytin, a natural degradation product of chlorophyll that can interfere with analysis because it has an absorption peak in the same spectral region. It is used as a proxy indicator of water quality because of its predictable response to nutrient availability. Increases in nutrients can potentially lead to blooms in phytoplankton biomass, affecting water quality and ecosystem health. The corrected chlorophyll-a maximum concentration for WBID 1575 was 69.80 µg/L, and the mean concentration was 9.19 µg/L.

Table 5.1 Water quality stations located in WBIDs 1569 and 1575

WBID	Station Number
1575	21FLPDEM13-01
	21FLTPA 27593868241169
	21FLBRA 1575-A

Table 5.2 Water quality data for WBID 1575

Parameter	Stats	WBID 1575
BOD, 5 Day, 20°C (mg/L)	# of obs	8
	min	1.00
	max	5.00
	mean	2.22
	Geomean	1.87
DO, Analysis by Probe (mg/L)	# of obs	43
	min	0.39
	max	17.14
	mean	4.13
	Geomean	3.29
Nitrogen, Total (mg/L as N)	# of obs	23
	min	0.36
	max	1.62
	mean	1.01
	Geomean	0.95
Phosphorus, Total (mg/L as P)	# of obs	26
	min	0.12
	max	0.35
	mean	0.21
	Geomean	0.20
Chlorophyll-A-corrected (µg/L)	# of obs	23
	min	1.00
	max	69.80
	mean	9.33
	Geomean	4.27

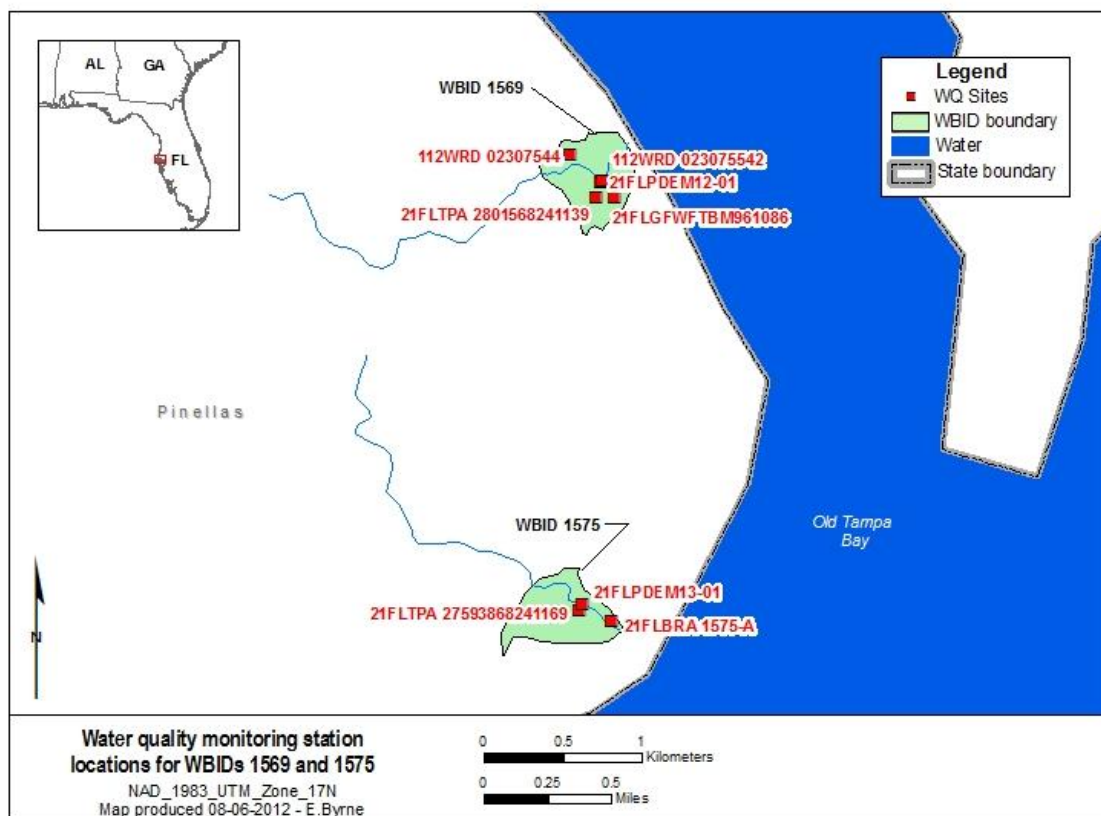


Figure 5.1 Water quality monitoring station locations for impaired WBID 1575 in the Coastal Old Tampa Bay Tributaries Planning Unit

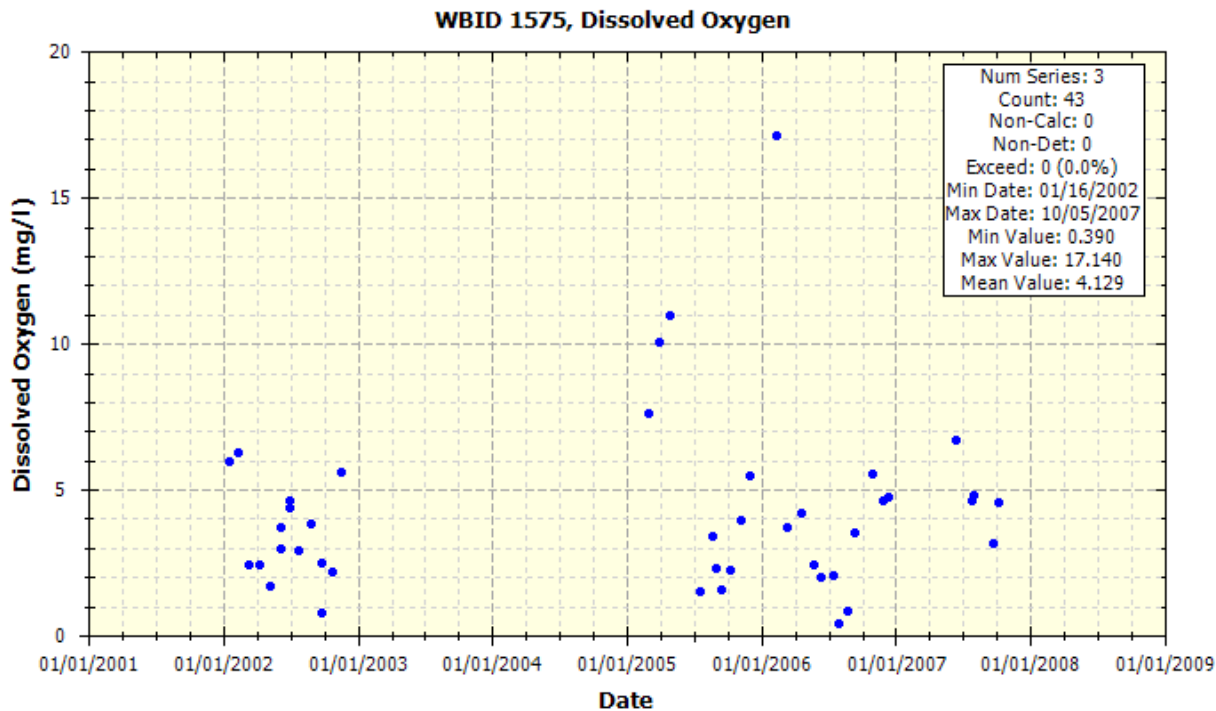


Figure 5.2 Dissolved oxygen concentrations for WBID 1575

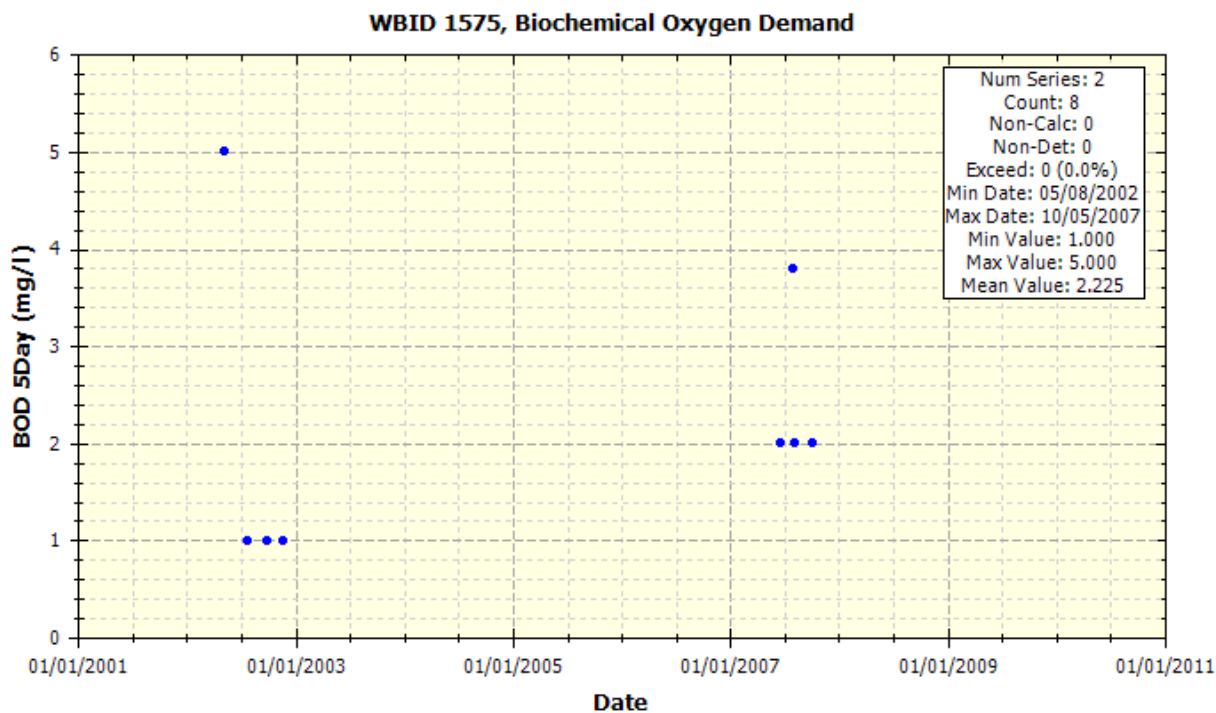


Figure 5.3 Biochemical oxygen demand concentrations for WBID 1575

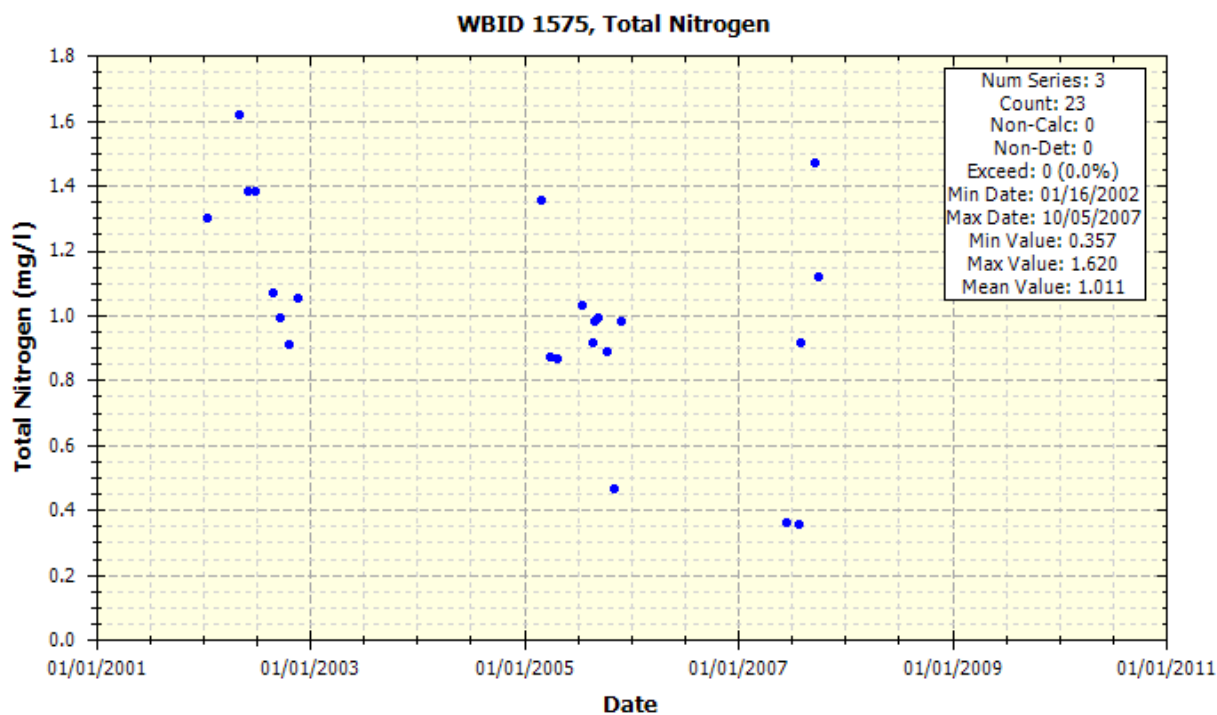


Figure 5.4 Total nitrogen concentrations for WBID 1575

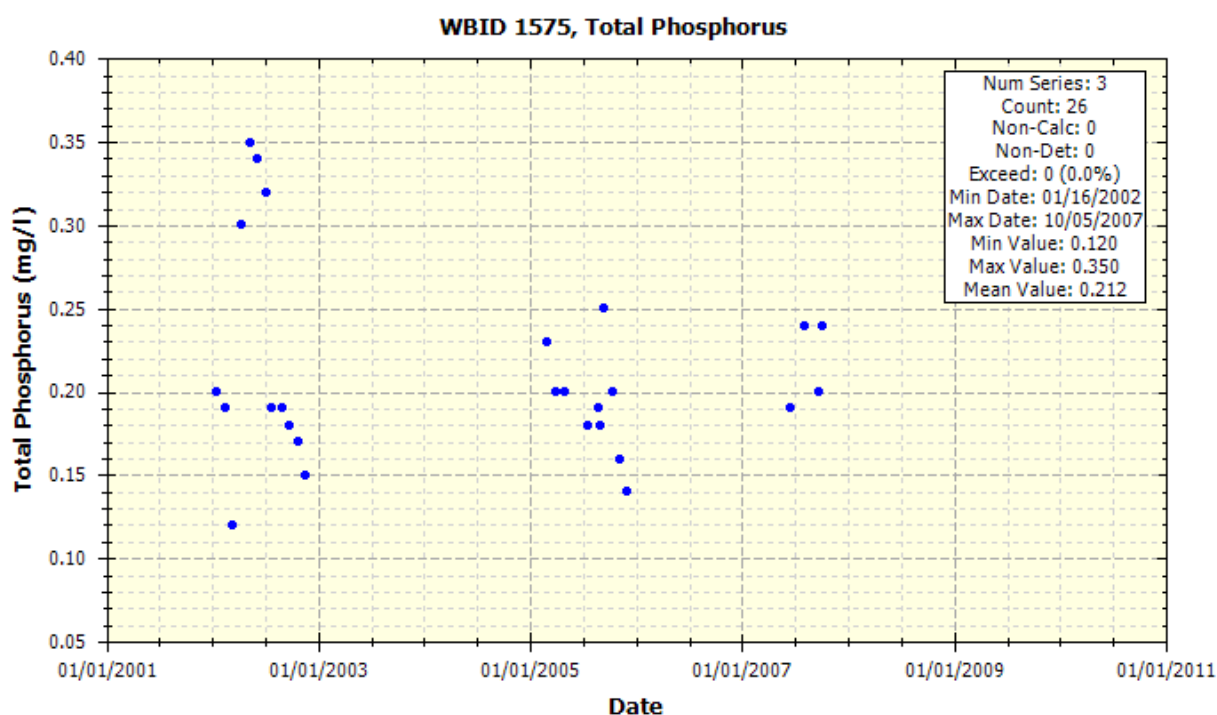


Figure 5.5 Total phosphorus concentrations for WBID 1575

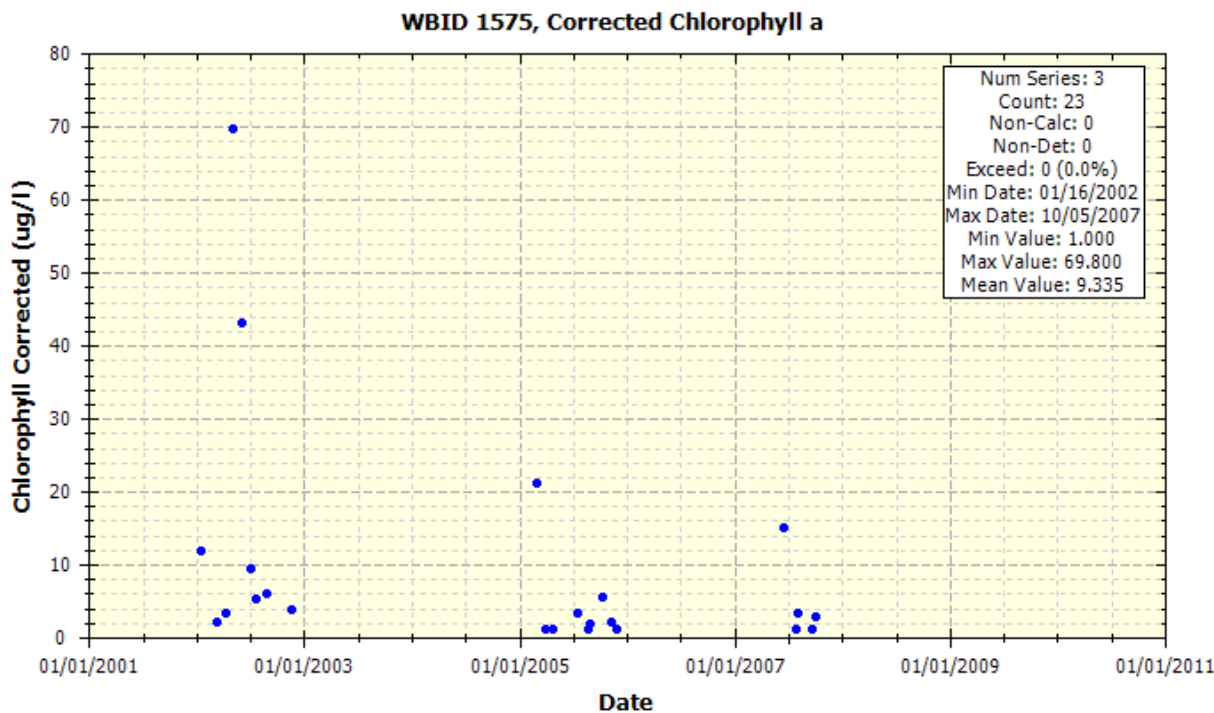


Figure 5.6 Corrected chlorophyll a concentrations for WBID 1575

## 6.0 SOURCE AND LOAD ASSESSMENT

An important part of the TMDL analysis is the identification of source categories, source subcategories, or individual sources of pollutants in the watershed and the amount of loading contributed by each of these sources. Sources are broadly classified as either point or nonpoint sources. Nutrients can enter surface waters from both point and nonpoint sources.

### 6.1 Point Sources

A point source is defined as a discernable, confined, and discrete conveyance from which pollutants are or may be discharged to surface waters. Point source discharges of industrial wastewater and treated sanitary wastewater must be authorized by National Pollutant Discharge Elimination System (NPDES) permits. NPDES permitted discharges include continuous discharges such as wastewater treatment facilities as well as some stormwater driven sources such as municipal separate stormwater sewer systems (MS4s), certain industrial facilities, and construction sites over one acre.

#### 6.1.1 Wastewater/Industrial Permitted Facilities

A TMDL wasteload allocation (WLA) is given to wastewater and industrial NPDES permitted facilities discharging to surface waters within an impaired watershed. There are no permitted facilities in WBID 1575.



### 6.1.2 Stormwater Permitted Facilities/MS4s

MS4s are point sources also regulated by the NPDES program. According to 40 CFR 122.26(b)(8), an MS4 is “a conveyance or system of conveyances (including roads with drainage systems, municipal streets, catch basins, curbs, gutters, ditches, man-made channels, or storm drains):

- (i) Owned or operated by a State, city, town, borough, county, parish, district, association, or other public body (created by or pursuant to State law)...including special districts under State law such as a sewer district, flood control district or drainage district, or similar entity, or an Indian tribe or an authorized Indian tribal organization, or a designated and approved management agency under section 208 of the Clean Water Act that discharges into waters of the United States.
- (ii) Designed or used for collecting or conveying storm water;
- (iii) Which is not a combined sewer; and
- (iv) Which is not part of a Publicly Owned Treatment Works

MS4s may discharge nutrients and other pollutants to waterbodies in response to storm events. In 1990, USEPA developed rules establishing Phase I of the NPDES stormwater program, designed to prevent harmful pollutants from being washed by stormwater runoff into MS4s (or from being dumped directly into the MS4) and then discharged from the MS4 into local waterbodies. Phase I of the program required operators of “medium” and “large” MS4s (those generally serving populations of 100,000 or greater) to implement a stormwater management program as a means to control polluted discharges from MS4s. Approved stormwater management programs for medium and large MS4s are required to address a variety of water quality related issues including roadway runoff management, municipal owned operations, hazardous waste treatment, etc.

Phase II of the rule extends coverage of the NPDES stormwater program to certain “small” MS4s. Small MS4s are defined as any MS4 that is not a medium or large MS4 covered by Phase I of the NPDES stormwater program. Only a select subset of small MS4s, referred to as “regulated small MS4s”, requires an NPDES stormwater permit. Regulated small MS4s are defined as all small MS4s located in “urbanized areas” as defined by the Bureau of the Census, and those small MS4s located outside of “urbanized areas” that are designated by NPDES permitting authorities.

In October 2000, USEPA authorized FDEP to implement the NPDES stormwater program in all areas of Florida except Indian tribal lands. FDEP’s authority to administer the NPDES program is set forth in Section 403.0885, Florida Statutes (FS). The three major components of NPDES stormwater regulations are:

- MS4 permits that are issued to entities that own and operate master stormwater systems, primarily local governments. Permittees are required to implement comprehensive stormwater management programs designed to reduce the discharge of pollutants from the MS4 to the maximum extent practicable.
- Stormwater associated with industrial activities, which is regulated primarily by a multisector general permit that covers various types of industrial facilities. Regulated



industrial facilities must obtain NPDES stormwater permit coverage and implement appropriate pollution prevention techniques to reduce contamination of stormwater.

- Construction activity general permits for projects that ultimately disturb one or more acres of land and which require the implementation of stormwater pollution prevention plans to provide for erosion and sediment control during construction.

Stormwater discharges conveyed through the storm sewer system covered by the permit are subject to the WLA of the TMDL. Any newly designated MS4s will also be required to achieve the percent reduction allocation presented in this TMDL. There is one MS4 permit associated with the impaired WBID, FLS000005. The MS4 Phase I C permit is for Pinellas County and its co-permittee, the City of Tarpon Springs. The Phase I C MS4 permit for Pinellas County also falls under the District VII Florida Department of Transportation.

## 6.2 Nonpoint Sources

Nonpoint sources of pollution are diffuse sources that cannot be identified as entering a waterbody through a discrete conveyance at a single location. For nutrients, these sources include runoff of agricultural fields, golf courses, and lawns, septic tanks, and residential developments outside of MS4 areas. Nonpoint source pollution generally involves a buildup of pollutants on the land surface that wash off during rain events and as such, represent contributions from diffuse sources, rather than from a defined outlet. Potential nonpoint sources are commonly identified, and their loads estimated, based on land cover data. Most methods calculate nonpoint source loadings as the product of the water quality concentration and runoff water volume associated with certain land use practices. The mean concentration of pollutants in the runoff from a storm event is known as the event mean concentration. Figure 3.1 provides a map of the land use, while

Table 3.1 lists the land use distribution in WBID 1575.

The following sections are organized by land use. Each section provides a description of the land use, the typical sources of nutrient loading (if applicable), and typical total nitrogen and total phosphorus event mean concentrations.

### 6.2.1 Urban Areas

Urban areas include land uses such as residential, industrial, extractive and commercial. Land uses in this category typically have somewhat high total nitrogen event mean concentrations and average total phosphorus event mean concentrations. Nutrient loading from MS4 and non-MS4 urban areas is attributable to multiple sources including stormwater runoff, leaks and overflows from sanitary sewer systems, illicit discharges of sanitary waste, runoff from improper disposal of waste materials, leaking septic systems, and domestic animals.

In 1982, Florida became the first state in the country to implement statewide regulations to address the issue of nonpoint source pollution by requiring new development and redevelopment to treat stormwater before it is discharged. The Stormwater Rule, as outlined in Chapter 403 FS, was established as a technology-based program that relies upon the implementation of Best Management Practices (BMPs) that are designed to achieve a specific level of treatment (i.e., performance standards) as set forth in Chapter 62-40, FAC.

Florida's stormwater program is unique in having a performance standard for older stormwater systems that were built before the implementation of the Stormwater Rule in 1982. This rule states: "the pollutant loading from older stormwater management systems shall be reduced as needed to restore or maintain the beneficial uses of water." [FAC 62-40-.432(2)(c)]

Nonstructural and structural BMPs are an integral part of the State's stormwater programs. Nonstructural BMPs, often referred to as "source controls", are those that can be used to prevent the generation of nonpoint source pollutants or to limit their transport off-site. Typical nonstructural BMPs include public education, land use management, preservation of wetlands and floodplains, and minimization of impervious surfaces. Technology-based structural BMPs are used to mitigate the increased stormwater peak discharge rate, volume, and pollutant loadings that accompany urbanization.

Urban, residential, and commercial developments are often a significant source of nutrients and oxygen-demanding substances. In WBID 1575, 100 percent of the land use is described as high intensity developed. Only 60 percent of the contributing land use is classified as high intensity development. An additional 23 percent of the contributing land use is classified as low or medium intensity development.

### ***Onsite Sewage Treatment and Disposal Systems (Septic Tanks)***

As stated above, leaking septic tanks or onsite sewage treatment and disposal systems (OSTDs) can contribute to nutrient loading in urban areas. Water from OSTDs is typically released to the ground through on-site, subsurface drain fields or boreholes that allow the water from the tank to percolate (usually into the surficial aquifers) and either transpire to the atmosphere through

surface vegetation or add to the flow of shallow ground water. When properly sited, designed, constructed, maintained, and operated, OSTDs are a safe means of disposing of domestic waste. The effluent from a well-functioning OSTD receives natural biological treatment in the soil and is comparable to secondarily treated wastewater from a sewage treatment plant. When not functioning properly, OSTDs can be a source of nutrients, pathogens, and other pollutants to both ground water and surface water.

The State of Florida Department of Health publishes data on new septic tank installations and the number of septic tank repair permits issued for each county in Florida. Table 6.1 summarizes the cumulative number of septic systems installed in Pinellas County since the 1970 census and the total number of repair permits issued for the ten years between 1999-2000 and 2009-2010 (FDOH 2009). The data do not reflect septic tanks removed from service. Leaking septic systems could be a relevant source of organic and nutrient loading in the watershed.

Table 6.1 County estimates of Septic Tanks and Repair Permits

County	Number of Septic Tanks (1970-2008)	Number of Repair Permits Issued (2000-2010)
Pinellas	23,868	3,152

Note: Source: <http://www.doh.state.fl.us/environment/ostds/statistics/ostdsstatistics.htm>

### 6.2.2 Pastures

Pastures include cropland and improved and unimproved pasturelands, such as non-tilled grasses woodland pastures, feeding operations, nurseries and vineyards; as well as specialty farms. Agricultural activities, including runoff of fertilizers or animal wastes from pasture and cropland and direct animal access to streams, can generate nutrient loading to streams. The highest total nitrogen and total phosphorus event mean concentrations are associated with agricultural land uses. There are no pasture land uses within WBID 1575 and only 17 acres of pasture in the contributing land use, therefore pasture land is not a source of excessive nutrients in this watersheds.

### 6.2.3 Clear cut/Sparse

The clear cut/sparse land use classification includes recent clear cuts, areas of sparse vegetation or herbaceous dry prairie, shrub and brushland, other early successional areas, and mixed rangeland. Event mean concentrations for clear cut/sparse can be relatively low for total nitrogen and total phosphorus. Approximately zero percent of the land uses within and contributing to WBID 1575 are classified as clear cut/sparse land uses.

### 6.2.4 Forests

Upland forests include flatwoods, oak, various types of hardwoods, conifers and tree plantations. Wildlife located within forested areas deposit their feces onto land surfaces where it can be transported to nearby streams during storm events. Generally, the pollutant load from wildlife is assumed to represent background concentrations. Event mean concentrations for upland forests

are low for both total nitrogen and total phosphorus. There are no forested land uses within WBID 1575, and only five percent of the contributing land use is classified as forested.

### **6.2.5 Water and Wetlands**

Water and Wetlands often have very low nutrient loadings, although decaying organic matter in wetlands can contribute to high organic nutrient concentrations. There is no open water or wetlands in WBID 1575, and only five percent of the contributing land use is classified as wetlands or open water.

### **6.2.6 Quarries/Strip mines**

This land use classification includes quarries, strip mines, exposed rock and soil, fill areas, reclaimed lands, and holding ponds. Event mean concentrations for some barren lands tend to be higher in total nitrogen. There are no quarries or strip mine land uses within WBID 1575.

## **7.0 ANALYTICAL APPROACH**

In the development of a TMDL there needs to be a method for relating current loadings to the observed water quality problem. This relationship could be: statistical (regression for a cause and effect relationship), empirical (based on observations not necessarily from the waterbody in question) or mechanistic (physically and/or stochastically based) that inherently relates cause and effect using physical and biological relationships.

A mechanistic model was used in the development of the Mullet Creek TMDLs to relate the physical and biological relationships. A dynamic watershed model was used to predict the quantity of water and pollutants associated with runoff from rain events.

The period of simulation that was considered in the development of this TMDL is January 1, 2002 to December 31, 2009. The model was used to predict time series for BOD, TN, TP, and DO. The model was calibrated to current conditions and was then used to predict improvements in water quality as a function of reductions in loadings.

### **7.1 Mechanistic Model**

The Loading Simulation Program in C++ (LSPC), is a watershed modeling system that includes streamlined Hydrologic Simulation Program Fortran (HSPF) algorithms for simulating hydrology, sediment, and general water quality overland as well as a simplified stream fate and transport model. LSPC is derived from the Mining Data Analysis System (MDAS), which was originally developed by USEPA Region 3 (under contract with Tetra Tech) and has been widely used for TMDLs. In 2003, the USEPA Region 4 contracted with Tetra Tech to refine, streamline, and produce user documentation for the model for public distribution. LSPC was developed to serve as the primary watershed model for the USEPA TMDL Modeling Toolbox. LSPC was used to simulate runoff (flow, biological oxygen demand, total nitrogen, total phosphorus and dissolved oxygen) from the land surface using a daily timestep for current and natural conditions.

LSPC provided tributary flows and temperature to the EFDC estuary models and tributary water quality concentrations to WASP7 estuary models.

An LSPC model was utilized to estimate the nutrient loads within and discharged from Mullet Creek watershed. The LSPC model utilized the data inputs, including land use and weather data, from the larger Tampa Bay Watershed model (USEPA 2012a and USEPA 2012b).

In order to evaluate the contributing sources to a waterbody and to represent the spatial variability of these sources within the watershed model, the contributing drainage area was represented by a series of sub-watersheds for each of the models. The sub-watersheds for the Tampa Bay Watershed model were developed using the 12-digit hydrologic unit code (HUC12) watershed data layer and the Geological Survey (USGS) National Hydrograph Dataset (NHD). The sub-watersheds were re-delineated at a smaller scale for the Mullet Creek Watershed model, once again using the NHD catchments as well as the USGS National Elevation Dataset Digital Elevation Model (Figure 7.1). This figure also shows the location of the impaired WBID within the modeled area.

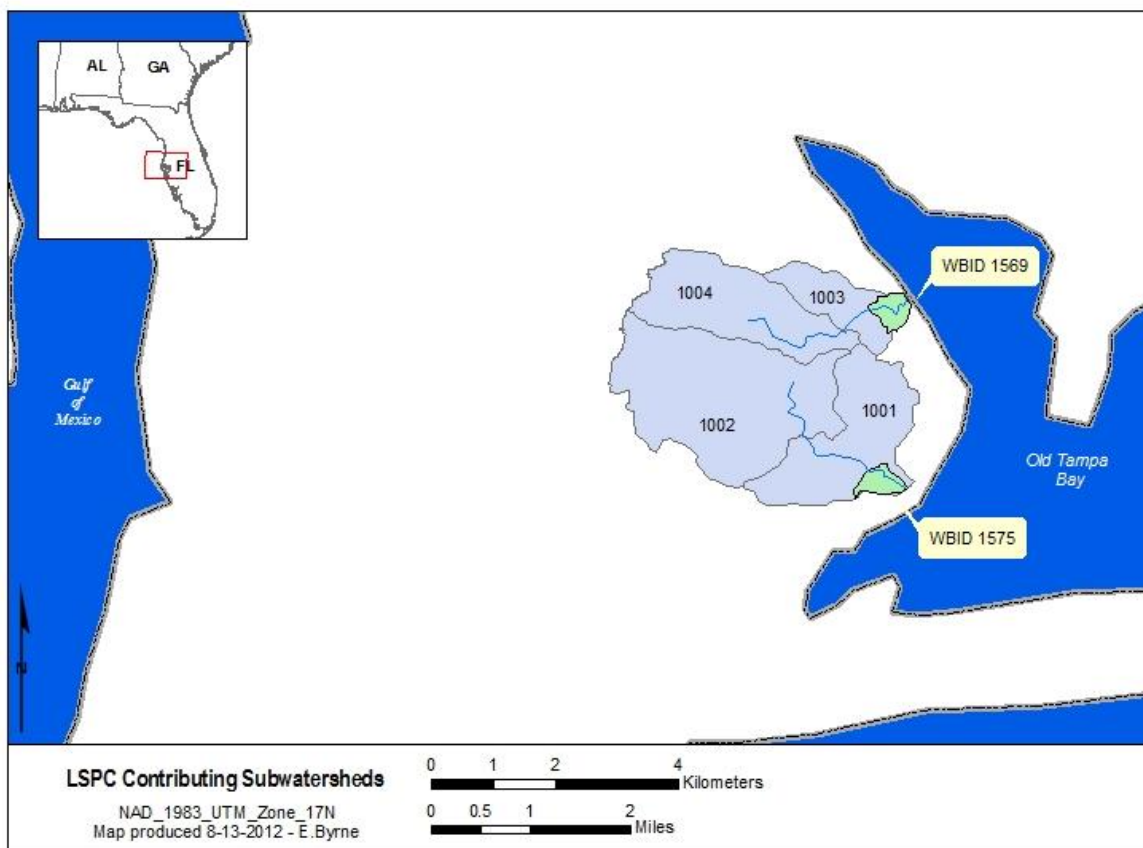


Figure 7.1 Contributing LSPC subwatershed boundaries for WBID1575

The LSPC model has a representative reach defined for each sub-watershed, and the main channel stem within each sub-watershed was used as the representative reach. The characteristics for each reach include the length and slope of the reach, the channel geometry and



the connectivity between the sub-watersheds. Length and slope data for each reach was obtained using the USGS DEM and NHD data.

The attributes supplied for each reach were used to develop a function table (FTABLE) that describes the hydrology of the stream reach by defining the functional relationship between water depth, surface area, water volume, and outflow in the segment. The assumption of a fixed depth, area, volume, outflow relationship rules out cases where the flow reverses direction or where one reach influences another upstream of it in a time-dependent way. LSPC does not model the tidal flow in the low-lying estuaries, and therefore the main Tampa Bay Watershed model was calibrated to non-tidally influenced USGS gages.

The watershed model uses land use data as the basis for representing hydrology and nonpoint source loadings. The FDEP Level III Florida Land Use, specifically the Southwest Florida Water Management District (SWFWMD) 2004 dataset, was used to determine the land use representation. The National Landuse Coverage Dataset (NLCD) was used to develop the impervious land use representations.

The SWFWMD coverage utilized a variety of land use classes which were grouped and re-classified into 18 land use categories: beaches/dune/mud, open water, utility swaths, developed open space, developed low intensity, developed medium intensity, developed high intensity, clear-cut/sparse, quarries/strip mines, deciduous forest, evergreen forest, mixed forest, golf courses, pasture, row crop, forested wetland, non-forested wetland (salt/brackish), and non-forested wetland (freshwater). The LSPC model requires division of land uses in each sub-watershed into separate pervious and impervious land units. The 2006 NLCD percent impervious coverage was used to determine the percent impervious area associated with each land use category. Any impervious areas associated with utility swaths, developed open space, and developed low intensity, were grouped together and placed into a new land use category named *low intensity development impervious*. Impervious areas associated with medium intensity development and high intensity development were kept separate and placed into two new categories for *medium intensity development impervious* and *high intensity development impervious*, respectively. Finally, any impervious area not already accounted for in the three developed impervious categories, were grouped together into a fourth new category for all remaining impervious land use.

Soil data for the Florida watersheds was obtained from the Soil Survey Geographic Database (SSURGO). The database was produced and distributed by the Natural Resources Conservation Service (NRCS) - National Cartography and Geospatial Center (NCGC). The SSURGO data was used to determine the total area that each hydrologic soil group covered within each sub-watershed. The sub-watersheds were represented by the hydrologic soil group that had the highest percentage of coverage within the boundaries of the sub-watershed. There were four hydrologic soil groups which varied in their infiltration rates and water storage capacity.

In the watershed models, nonpoint source loadings and hydrological conditions are dependent on weather conditions. Hourly data from weather stations within the boundaries of, or in close proximity to, the sub-watersheds were applied to the watershed model. A weather data forcing file was generated in ASCII format (\*.air) for each meteorological station used in the hydrological evaluations in LSPC. Each meteorological station file contained atmospheric data

used in modeling the hydrological processes. These data included precipitation, air temperature, dew point temperature, wind speed, cloud cover, evaporation, and solar radiation. These data are used directly, or calculated from the observed data. The Tampa Bay Watershed model weather stations contained data from 1996 through 2009.

The hydrodynamic calibration parameters from the larger Tampa Bay Watershed model were used to populate the Mullet Creek watershed model. The Tampa Bay Watershed model was calibrated to continuous flow USGS gages. No continuous measured flow data was located in the Mullet watershed, so no calibration updates were done for flow in Mullet Creek and the Tampa Bay Watershed model parameterization was used.

Water quality parameters from the larger Tampa Bay Watershed model were used to populate the Mullet Watershed model. The Tampa Bay Watershed model was calibrated to several water quality stations using data was taken from IWR38. The Mullet Creek m was calibrated to water quality data from IWR44, specifically to station 21FLPDEM 13-02, which contained data records for the parameters of interest. LSPC water quality calibration results are presented in through Figure 7.7 in Section 7.2.1.

## **7.2 Scenarios**

Two modeling scenarios were developed and evaluated in this TMDL determination: a current condition and a natural condition scenario. Concentrations and loadings were evaluated to determine if DO concentrations in the natural condition scenario could meet the DO standard, and the impact of nutrients on the DO concentrations. The results from the scenarios were used to develop the TMDL.

### **7.2.1 Current Condition**

The current condition scenario evaluated current hydrologic and water quality conditions in the watershed, specifically water quality concentration and loadings at the outlet of WBID 1575. The current condition annual average concentrations for Mullet Creek are presented in Table 7.1. The current condition simulation was used to determine the base loadings for the WBID 1575. These base loadings (Table 7.2), when compared with the TMDL scenarios, were used to determine the percent reduction in nutrient loads that will be needed to achieve water quality standards. Figure 7.2 through Figure 7.7 provides the calibrated current condition modeled parameters for WBID 1575.

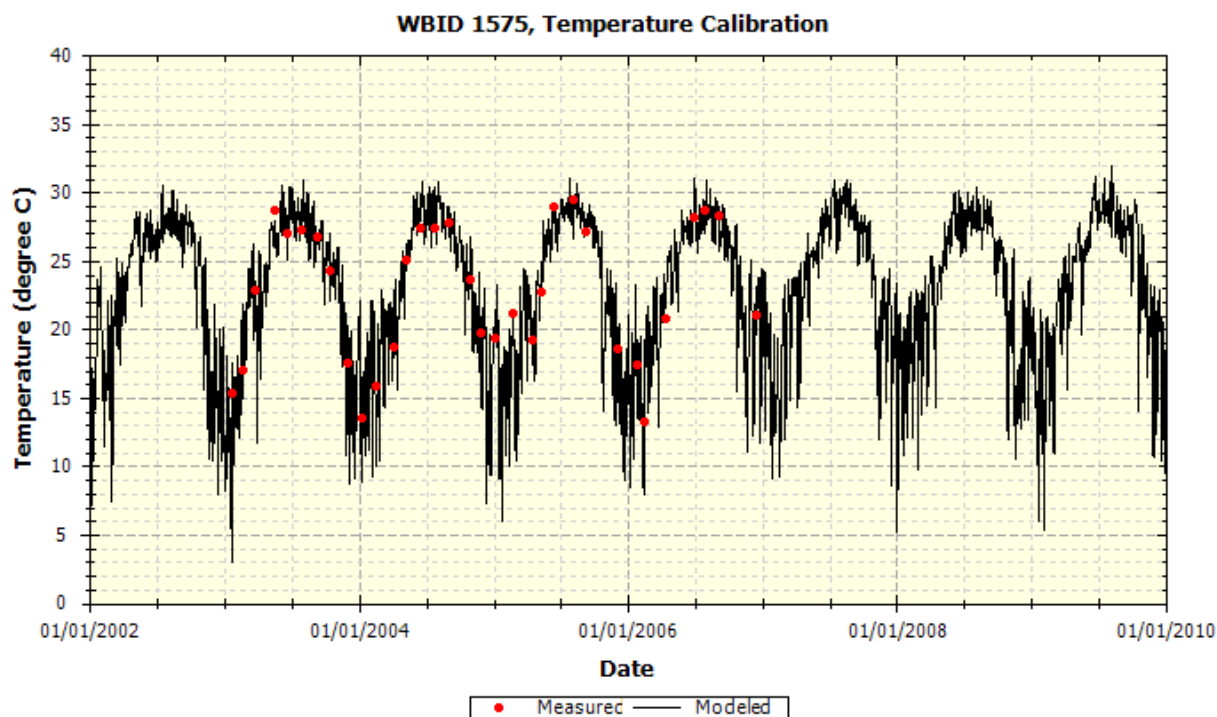


Figure 7.2 Simulated temperature verses measured temperature for Mullet Creek at station 21FLPDEM 13-02

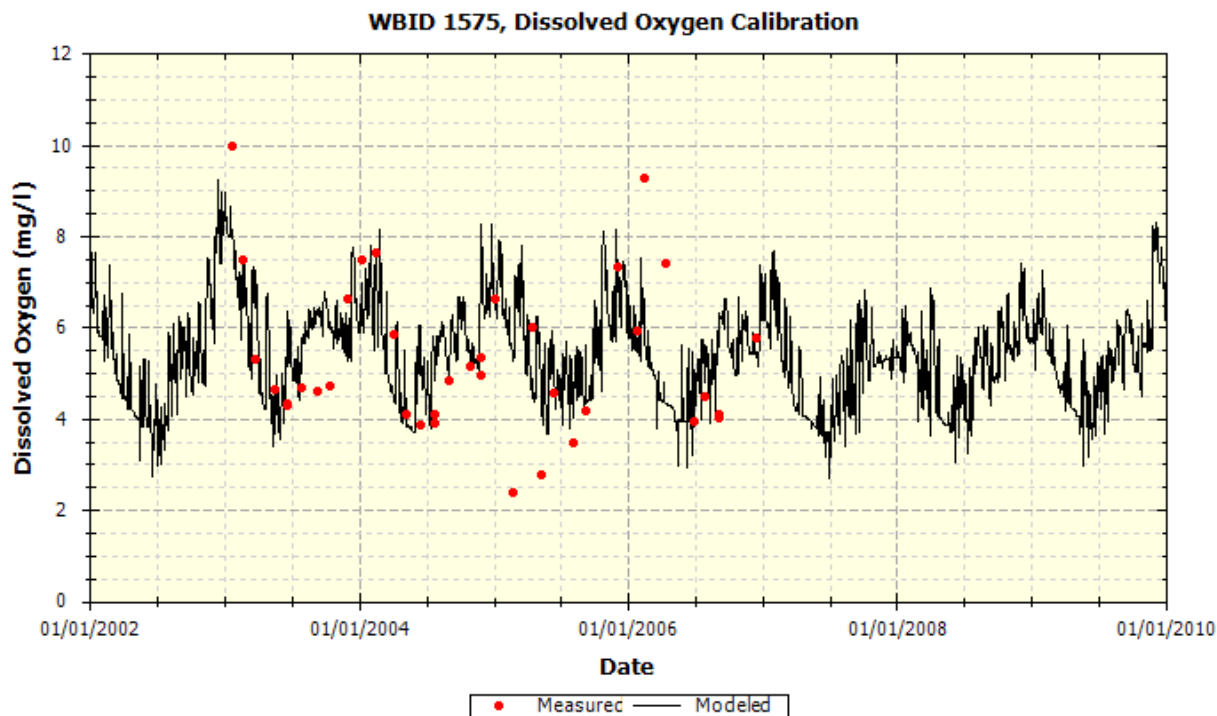


Figure 7.3 Simulated dissolved oxygen verses measured dissolved oxygen for Mullet Creek at station 21FLPDEM 13-02



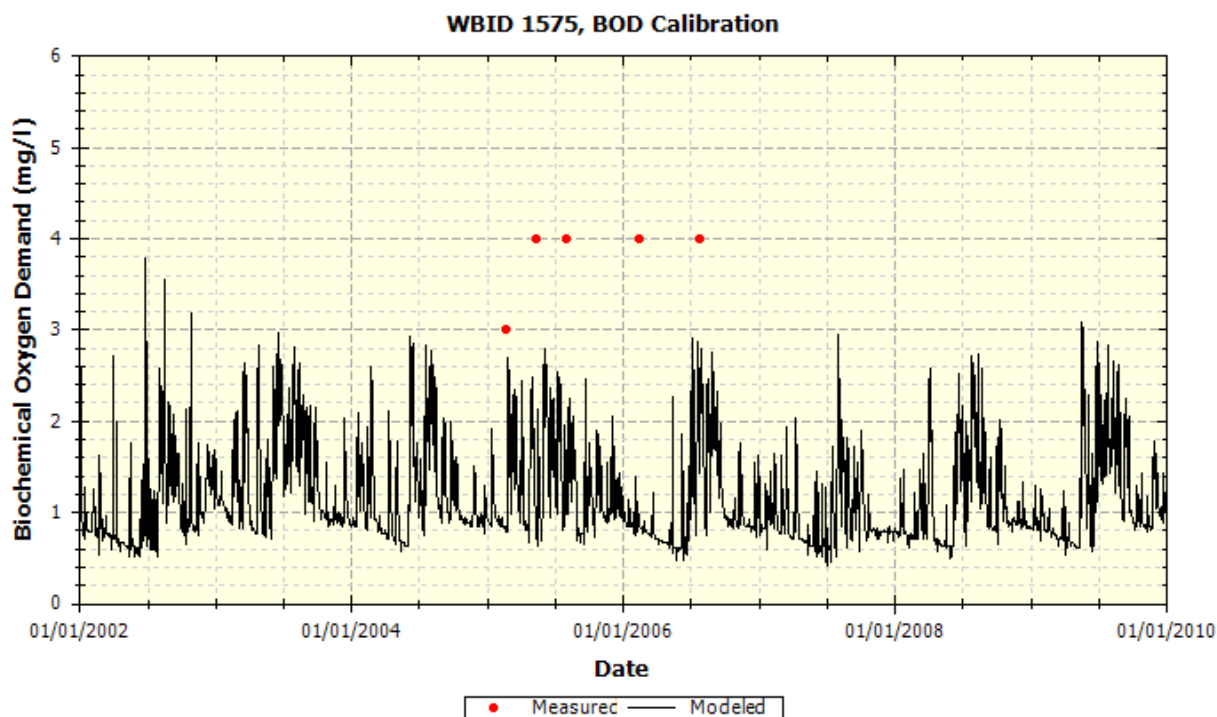


Figure 7.4 Simulated biochemical oxygen demand versus measured biochemical oxygen demand for Mullet Creek at station 21FLPDEM 13-02

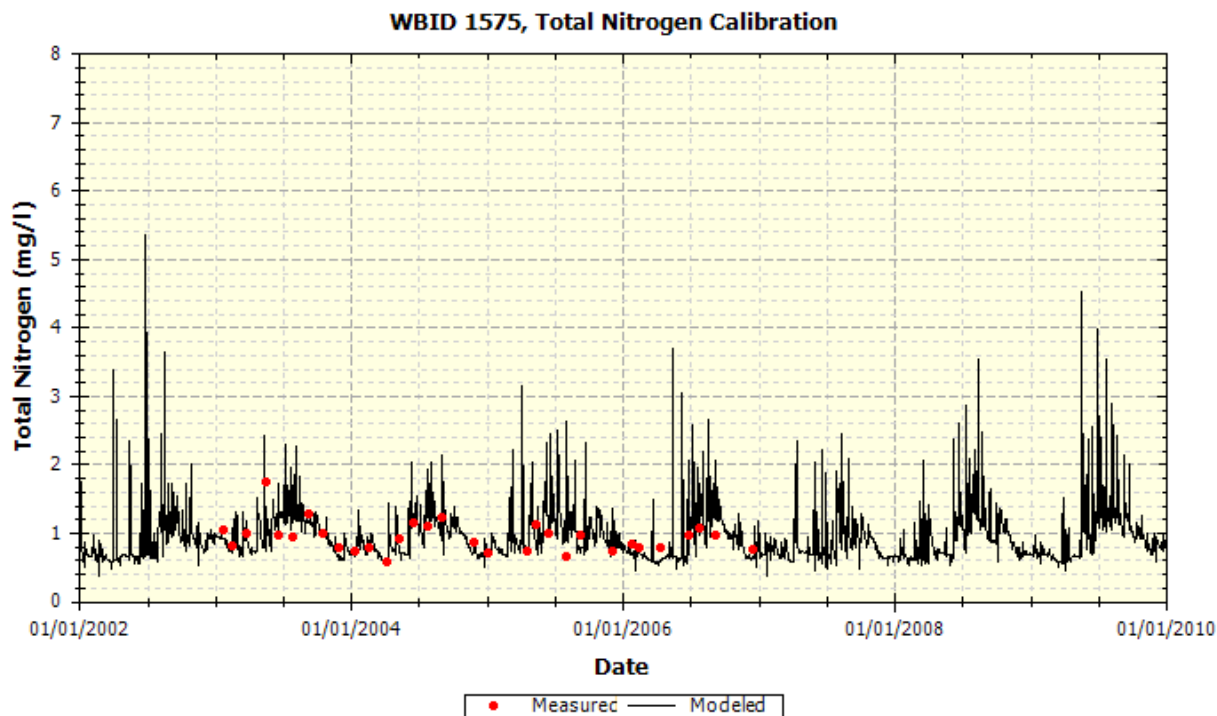


Figure 7.5 Simulated total nitrogen versus measured total nitrogen for Mullet Creek at station 21FLPDEM 13-02

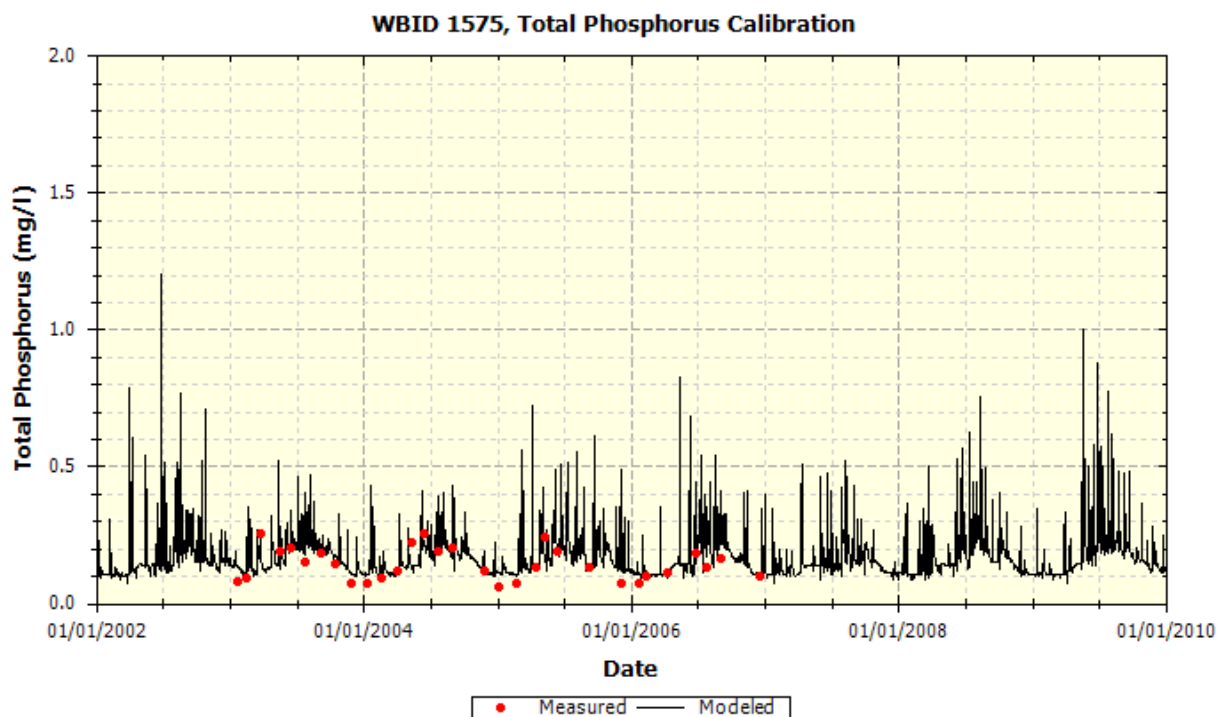


Figure 7.6 Simulated total phosphorus verses measured total phosphorus for Mullet Creek at station 21FLPDEM 13-02

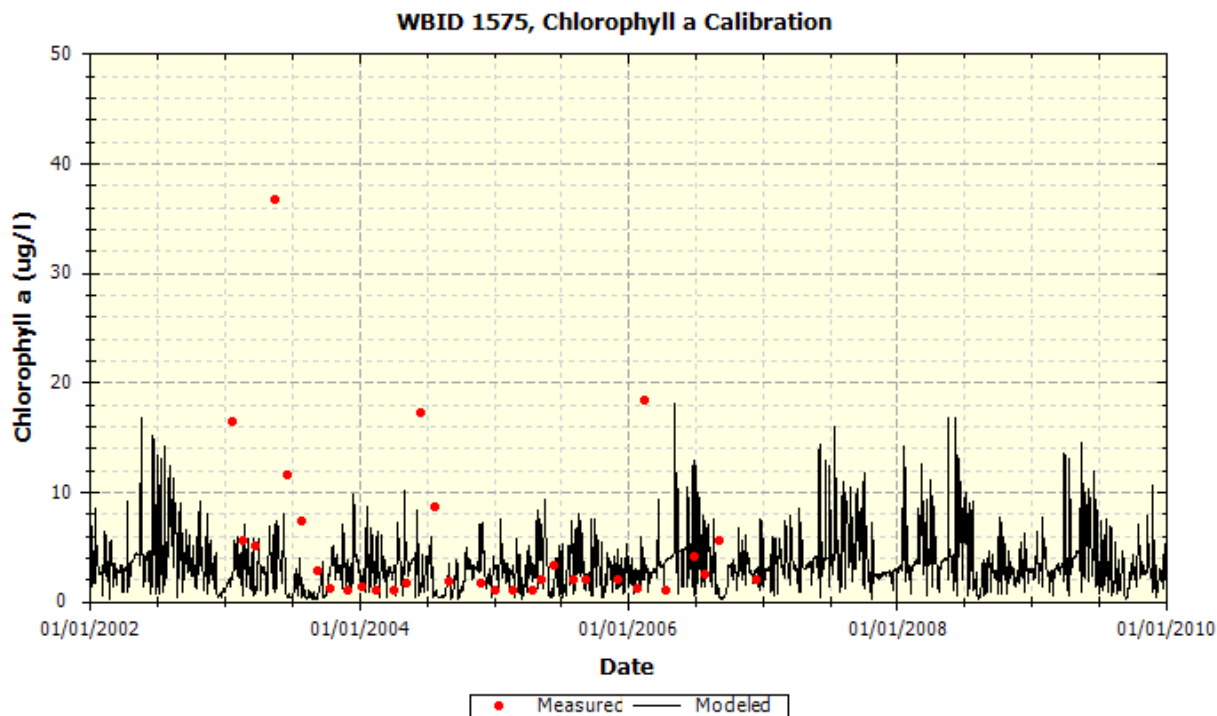


Figure 7.7 Simulated chlorophyll a verses measured chlorophyll a for Mullet Creek at station 21FLPDEM 13-02

Table 7.1 Current condition concentrations in WBID 1575 in the Coastal Old Tampa Bay Tributaries basin

Parameter	WBID 1575
Total nitrogen (mg/L)	0.91
Total phosphorus (mg/L)	0.17
BOD (mg/L)	1.20
DO (mg/L)	5.93

Table 7.2 Current condition loadings in WBID 1575 in the Coastal Old Tampa Bay Tributaries basin

Parameter	WBID 1575	
	WLA (kg/yr)	LA (kg/yr)
Total nitrogen (mg/L)	--	6,258
Total phosphorus (mg/L)	--	1,205
BOD (mg/L)	--	9,287

### 7.2.2 Natural Condition

The natural condition scenario was developed to estimate water quality conditions if there was no impact from anthropogenic sources. The point sources located in the model were removed for the natural condition analysis. Land uses that were associated with anthropogenic activities (urban, agriculture, transportation, barren lands and rangeland) were converted to upland forests or forested wetlands based on the current ratio of forest and wetland land uses in the model. The natural condition water quality predictions are presented in Table 7.3 and Table 7.4.

The purpose of the natural conditions scenario was to determine whether water quality standards could be achieved without abating the naturally occurring loads from the watershed. Figure 7.8 through Figure 7.13 provide the natural condition scenario modeled parameters for WBID 1575. In addition, Figure 7.14 provides the cumulative distribution function of DO concentrations for both the modeled existing condition and natural condition results for Mullet Creek. There is an increase in DO concentrations less than 5 mg/L in Mullet Creek.

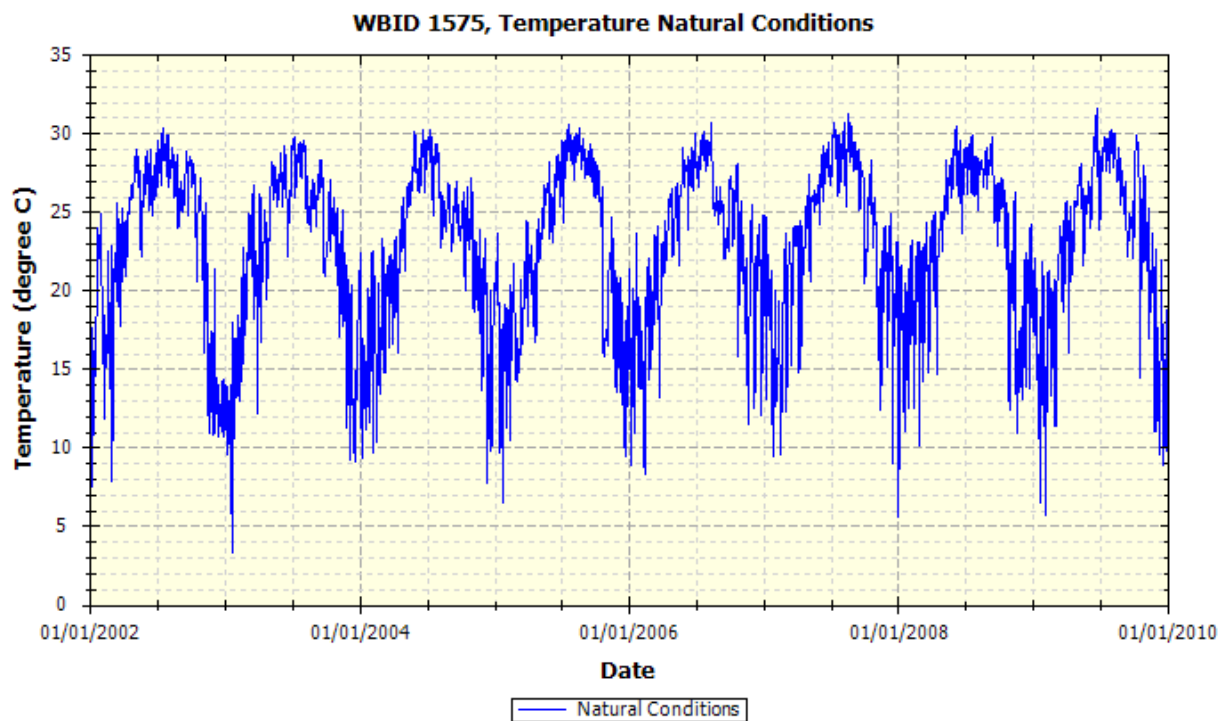


Figure 7.8 Natural condition temperature for WBID 1575, Mullet Creek

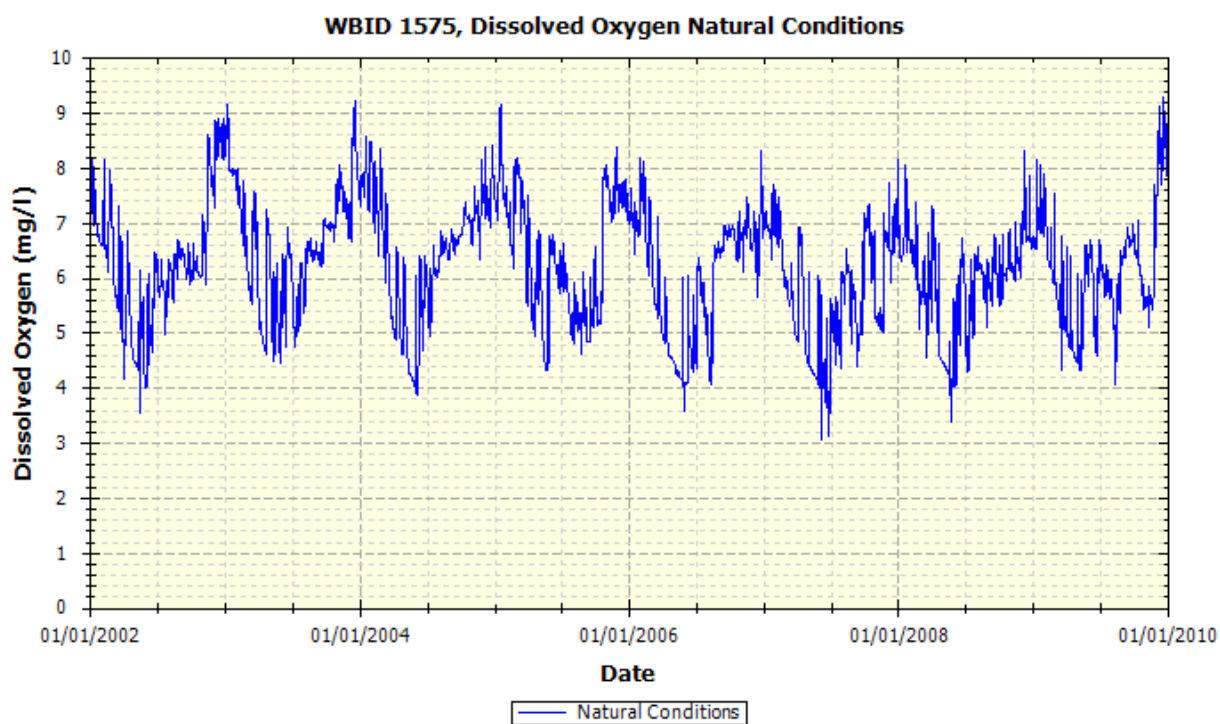


Figure 7.9 Natural condition dissolved oxygen for WBID 1575, Mullet Creek

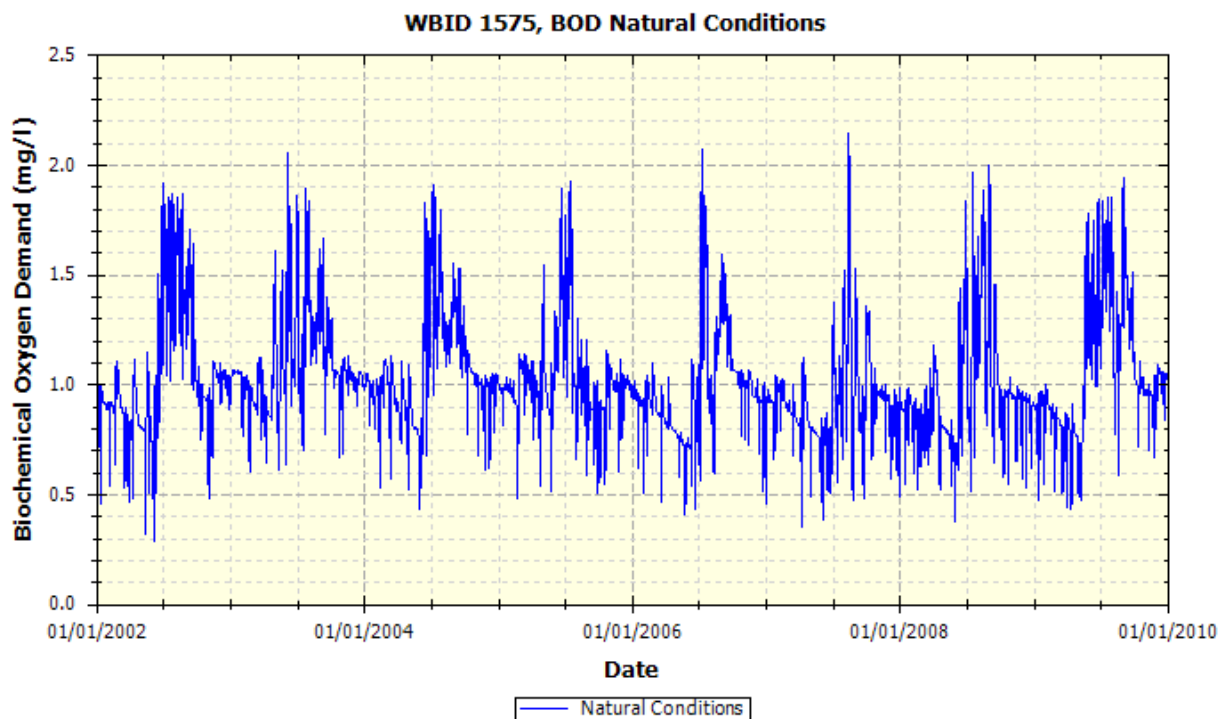


Figure 7.10 Natural condition biochemical oxygen demand for WBID 1575, Mullet Creek

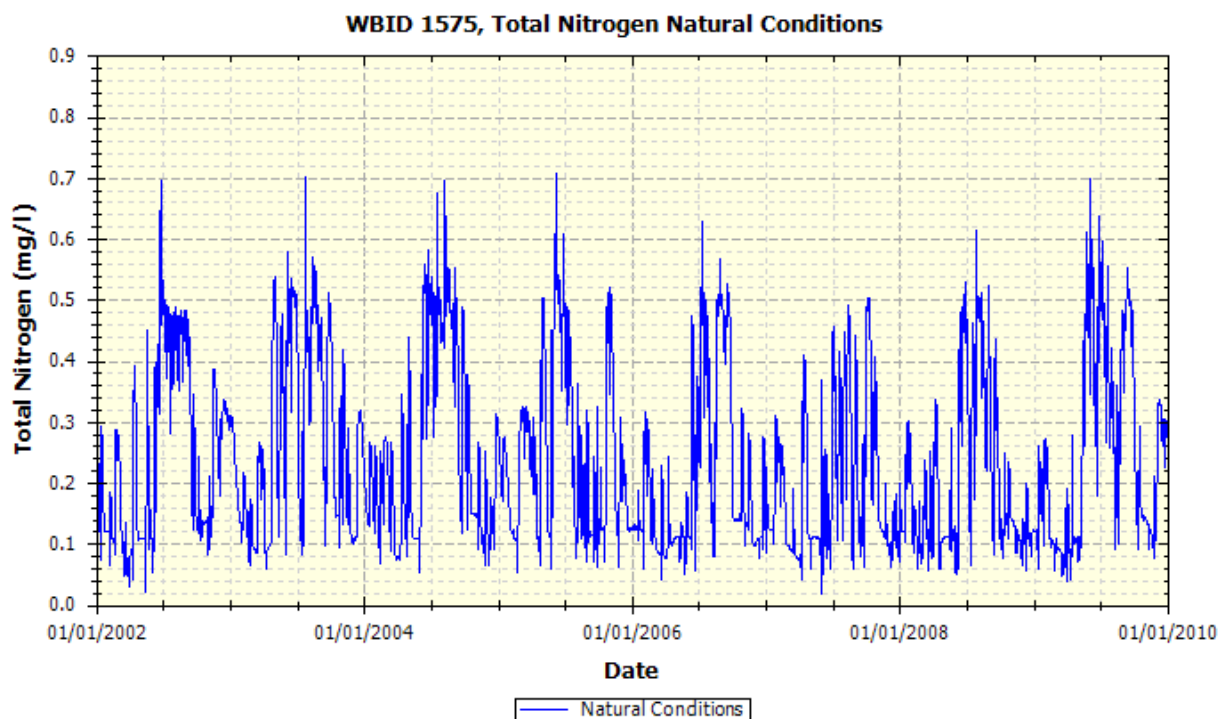


Figure 7.11 Natural condition total nitrogen for WBID 1575, Mullet Creek

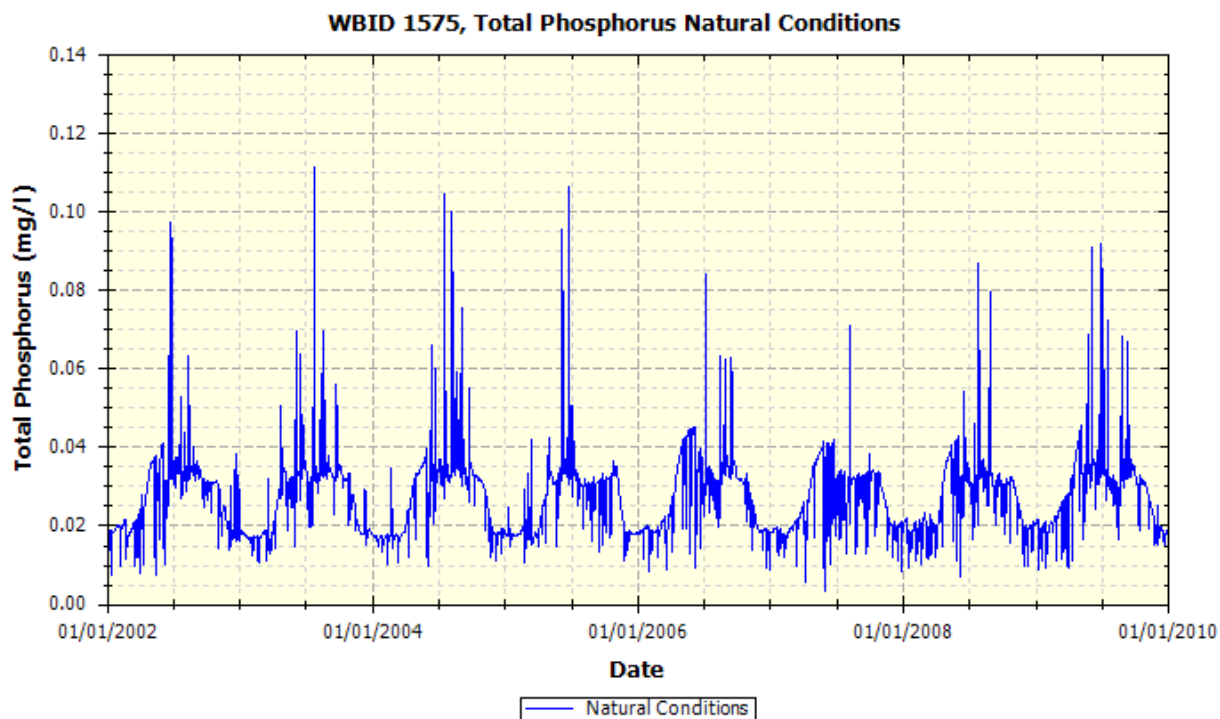


Figure 7.12 Natural condition total phosphorus for WBID 1575, Mullet Creek

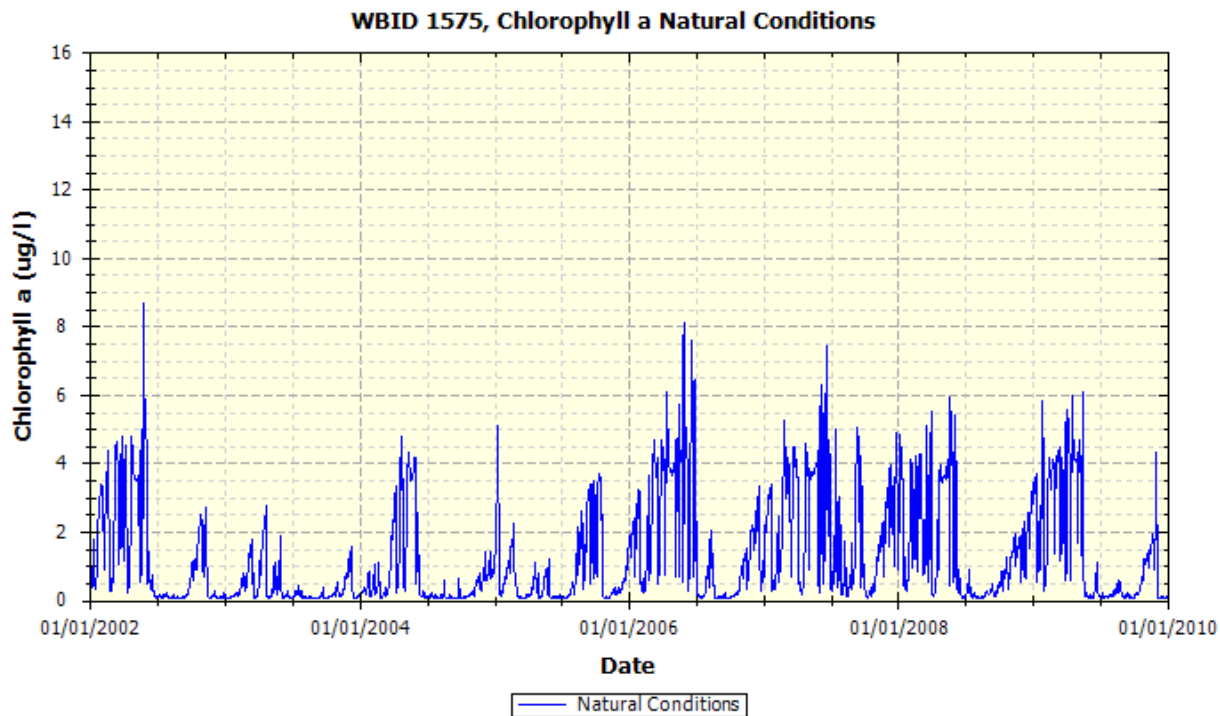


Figure 7.13 Natural condition chlorophyll a for WBID 1575, Mullet Creek

Table 7.3 Natural condition concentrations in WBID 1575 in the Coastal Old Tampa Bay Tributaries basin

Parameter	WBID 1575
Total nitrogen (mg/L)	0.23
Total phosphorus (mg/L)	0.03
BOD (mg/L)	1.01
DO (mg/L)	6.14

Table 7.4 Natural condition loadings in WBID 1575 in the Coastal Old Tampa Bay Tributaries basin

Parameter	WBID 1575	
	WLA (kg/yr)	LA (kg/yr)
Total nitrogen (mg/L)	--	1,513
Total phosphorus (mg/L)	--	132
BOD (mg/L)	--	4,351

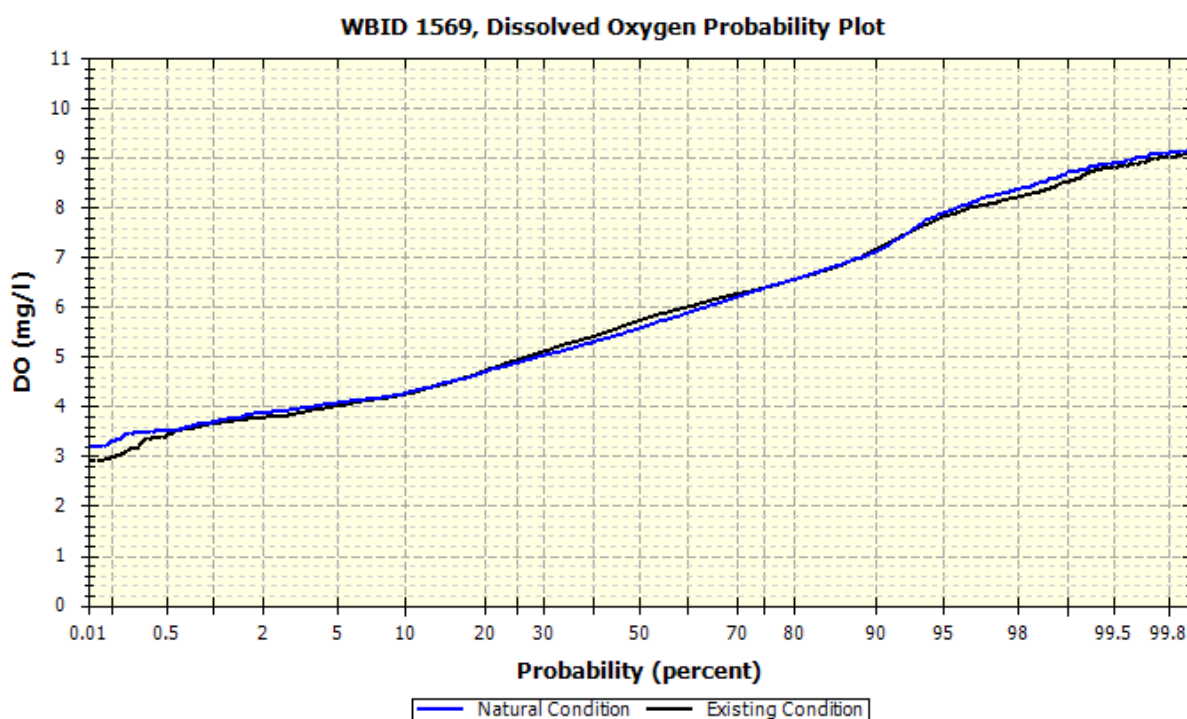


Figure 7.14 DO concentration cumulative distribution function for WBID 1575, Mullet Creek



## 8.0 TMDL DETERMINATION

The TMDL for a given pollutant and waterbody is comprised of the sum of individual wasteload allocations (WLAs) for point sources, and load allocations (LAs) for both nonpoint sources and natural background levels. In addition, the TMDL must include a margin of safety (MOS), either implicitly or explicitly, to account for the uncertainty in the relationship between pollutant loads and the quality of the receiving waterbody. Conceptually, this definition is represented by the equation:

$$\text{TMDL} = \sum \text{WLAs} + \sum \text{LAs} + \text{MOS}$$

The TMDL is the total amount of pollutant that can be assimilated by the receiving waterbody and still achieve water quality standards and the waterbody's designated use. In this TMDL development, allowable concentrations from all pollutant sources that cumulatively amount to no more than the TMDL must be set and thereby provide the basis to establish water quality-based controls. These TMDLs are expressed as annual geometric mean concentrations, since the approach used to determine the TMDL targets relied on geometric means. The TMDLs targets were determined to be the conditions needed to restore and maintain a balanced aquatic system. Furthermore, it is important to consider nutrient loading over time, since nutrients can accumulate in waterbodies.

The TMDL was determined for the concentrations and loadings at the outlet of WBID 1575, and included all loadings from upstream sources and streams. During the development of this TMDL, it was determined that the natural condition scenarios (removal of all anthropogenic sources and land uses) did not meet the Florida standards for DO. The DO was greater during the natural condition run in WBID 1575. There was a reduction in chlorophyll a concentrations in WBID 1575. In WBID 1575, the nutrient loadings from the natural condition scenario were therefore used to determine the TMDL in accordance with the Natural Conditions narrative rule because the reduction in nutrients increased DO and decreased chlorophyll a. The allocations for WBID 1575 for total nitrogen, total phosphorus, and biochemical oxygen demand are presented in Table 8.1.

Table 8.1 TMDL Load Allocations for Mullet Creek, WBID 1575

Constituent	Current Condition		TMDL Condition		Percent Reduction		
	WLA (kg/yr)	LA (kg/yr)	WLA (kg/yr)	LA (kg/yr)	WLA	LA	MS4
Total Nitrogen	--	6,258	--	1,513	--	76%	76%
Total Phosphorus	--	1,205	--	132	--	89%	89%
Biochemical Oxygen Demand	--	9,287	--	4,351	--	53%	53%



### **8.1 Critical Conditions and Seasonal Variation**

EPA regulations at 40 CFR 130.7(c)(1) require TMDLs to take into account critical conditions for stream flow, loading, and water quality parameters. The critical condition is the combination of environmental factors creating the "worst case" scenario of water quality conditions in the waterbody. By achieving the water quality standards at critical conditions, it is expected that water quality standards should be achieved during all other times. Seasonal variation must also be considered to ensure that water quality standards will be met during all seasons of the year, and that the TMDLs account for any seasonal change in flow or pollutant discharges, and any applicable water quality criteria or designated uses (such as swimming) that are expressed on a seasonal basis.

The critical condition for nonpoint source concentration and wet weather point source concentrations is typically an extended dry period followed by a rainfall runoff event. During the dry weather period, nutrients build up on the land surface, and are washed off by rainfall. The critical condition for continuous point source concentrations typically occurs during periods of low stream flow when dilution is minimized. Although loading of nonpoint source pollutants contributing to a nutrient impairment may occur during a runoff event, the expression of that nutrient impairment is more likely to occur during warmer months, and at times when the waterbody is poorly flushed.

### **8.2 Margin of Safety**

The Margin of Safety accounts for uncertainty in the relationship between a pollutant load and the resultant condition of the waterbody. There are two methods for incorporating an MOS into TMDLs (USEPA 1991):

- Implicitly incorporate the MOS using conservative model assumptions to develop allocations
- Explicitly specify a portion of the total TMDL as the MOS and use the remainder for Allocations

This TMDL uses an implicit MOS since the TMDL targets for nutrients were set to natural background conditions.

### **8.3 Waste Load Allocations**

Only MS4s and NPDES facilities discharging directly into lake segments (or upstream tributaries of those segments) are assigned a WLA. The WLAs, if applicable, are expressed separately for continuous discharge facilities (e.g., WWTPs) and MS4 areas, as the former discharges during all weather conditions whereas the later discharges in response to storm events.

### 8.3.1 Wastewater/Industrial Permitted Facilities

A TMDL wasteload allocation (WLA) is given to wastewater and industrial NPDES-permitted facilities discharging to surface waters within an impaired watershed. There are no continuous discharge NPDES-permitted point sources in WBID 1575, therefore no WLA was calculated.

### 8.3.2 Municipal Separate Storm Sewer System Permits

The WLA for MS4s are expressed in terms of percent reductions equivalent to the reductions required for nonpoint sources. Given the available data, it is not possible to estimate concentrations coming exclusively from the MS4 areas. Although the aggregate concentration allocations for stormwater discharges are expressed in numeric form, i.e., percent reduction, based on the information available today, it is infeasible to calculate numeric WLAs for individual stormwater outfalls because discharges from these sources can be highly intermittent, are usually characterized by very high flows occurring over relatively short time intervals, and carry a variety of pollutants whose nature and extent varies according to geography and local land use. For example, municipal sources such as those covered by this TMDL often include numerous individual outfalls spread over large areas. Water quality impacts, in turn, also depend on a wide range of factors, including the magnitude and duration of rainfall events, the time period between events, soil conditions, fraction of land that is impervious to rainfall, other land use activities, and the ratio of stormwater discharge to receiving water flow.

This TMDL assumes for the reasons stated above that it is infeasible to calculate numeric water quality-based effluent limitations for stormwater discharges. Therefore, in the absence of information presented to the permitting authority showing otherwise, this TMDL assumes that water quality-based effluent limitations for stormwater sources of nutrients derived from this TMDL can be expressed in narrative form (e.g., as best management practices), provided that: (1) the permitting authority explains in the permit fact sheet the reasons it expects the chosen BMPs to achieve the aggregate wasteload allocation for these stormwater discharges; and (2) the state will perform ambient water quality monitoring for nutrients for the purpose of determining whether the BMPs in fact are achieving such aggregate wasteload allocation.

All Phase 1 MS4 permits issued in Florida include a re-opener clause allowing permit revisions for implementing TMDLs once they are formally adopted by rule. Florida may designate an area as a regulated Phase II MS4 in accordance with Rule 62-620.800, FAC. Florida's Phase II MS4 Generic Permit has a "self-implementing" provision that requires MS4 permittees to update their stormwater management program as needed to meet their TMDL allocations once those TMDLs are adopted. Permitted MS4s will be responsible for reducing only the loads associated with stormwater outfalls which it owns, manages, or otherwise has responsible control. MS4s are not responsible for reducing other nonpoint source loads within its jurisdiction. All future MS4s permitted in the area are automatically prescribed a WLA equivalent to the percent reduction assigned to the LA. The MS4 service areas described in Section 6.1.2 of this report are required to meet the percent reduction prescribed in through the implementation of BMPs.

## 8.4 Load Allocations

The load allocation for nonpoint sources was assigned a percent reduction in nutrient concentrations from the current concentrations coming into the WBID addressed in the TMDL report.

## 9.0 RECOMMENDATIONS/IMPLEMENTATION

The initial step in implementing a TMDL is to more specifically locate pollutant source(s) in the watershed. FDEP employs the Basin Management Action Plan (B-MAP) as the mechanism for developing strategies to accomplish the specified load reductions. Components of a B-MAP are:

- Allocations among stakeholders
- Listing of specific activities to achieve reductions
- Project initiation and completion timeliness
- Identification of funding opportunities
- Agreements
- Local ordinances
- Local water quality standards and permits
- Follow-up monitoring

## 10.0 REFERENCES

Florida Administrative Code. Chapter 62-40, Water Resource Implementation Rule.

Florida Administrative Code. Chapter 62-302, Surface Water Quality Standards.

Florida Administrative Code. Chapter 62-303, Identification of Impaired Surface Waters.

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